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THE
JOURNAL,
OF THE
CINCINNATI
SOCIETY OF NATURAL HISTORY.



PUBLISHING COMMITTEE:

GEO. W. HARPER, R. M. BYRNES,
JOHN MICKLEBOROUGH, DAVIS L. JAMES.
L. M. HOSEA.

VOL. VI.—1883.



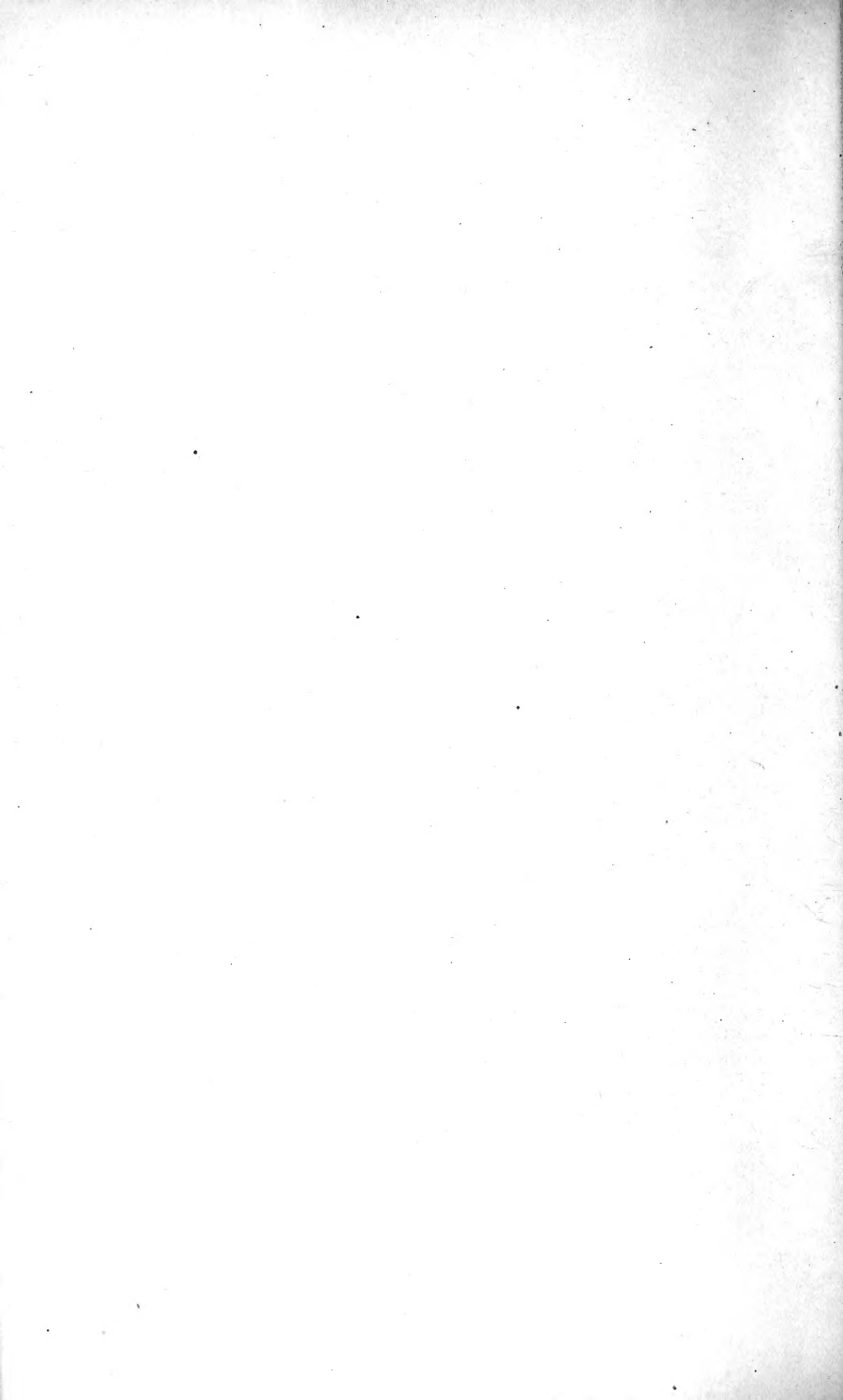
CINCINNATI:

PRINTED BY JAMES BARCLAY, 269 VINE STREET.



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THE JOURNAL
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CINCINNATI SOCIETY OF NATURAL HISTORY.

VOL. VI.

CINCINNATI, APRIL, 1883.

No. 1.

PROCEEDINGS OF THE SOCIETY.

TUESDAY EVENING, *January 2, 1883.*

Dr. R. M. Byrnes, President, in the chair. Present, fifteen members.

Rudolph F. Balke and Dr. N. P. Dandridge were elected members.

Prof. A. G. Wetherby read a paper on the variations in species of land and fresh water shells. The paper elicited considerable discussion, in which Dr. R. M. Byrnes participated.

Donations were announced as follows: From Smithsonian Institution, eight pamphlets and one volume; R. W. Shufeldt, one pamphlet; Secretary of State, Geological Survey of Ohio, vol. iv.; James W. Tufts, Boston, Mass., through Dr. R. M. Byrnes, seventeen specimens of marbles; O. M. Meyncke, four specimens of Polyporus nigricans, and specimens of acorns; Ralph Colvin, one pamphlet; the Signal Service Bureau, Monthly Weather Review; Dr. R. M. Byrnes, specimen rock from Indiana, two specimens of fungi, specimens of *Belostoma grandis*, three specimens lizards in alcohol; E. L. Sherwood, specimens of *Monticulipora frondosa*, and *Helicina suborbiculata*; Chas. M. Smith, specimens of pottery, etc., from mound in Missouri; Prof. E. S. Wayne, specimen of pigmy owl; Dr. A. J. Howe, specimen of short-eared owl; Prof. A. G. Wetherby, four specimens *Planorbis lentus*, five specimens *Unios*.

TUESDAY EVENING, *February 6, 1883.*

Dr. R. M. Byrnes, President, in the chair. Present, ten members.

It was announced that the Society would receive its friends on the evening of February 12th, from 8 to 9:30 P.M., on the seventy-fourth anniversary of the birth of Charles Darwin.

Donations were announced as follows: From G. H. French, four pamphlets; Cuvier Club, fourteen species mounted birds, one specimen fish; Dr. Robert Fletcher, one pamphlet on prehistoric trephining; Signal Service Bureau, annual report for 1880, and Weather Review; Ralph Colvin, four specimens manganese; Dr. J. A. Warder, five pamphlets; E. L. Sherwood, one specimen fossil; Joseph F. James, two pamphlets and one volume; Prof. H. W. Haynes, through Governor Cox, one pamphlet on Discovery of Palæolithic Implements in Egypt; Arthur F. Gray, twenty-nine species shells; Smithsonian Institute, volumes 22 and 23 of Contributions to Knowledge; Mr. Rombaugh, one specimen banded sandstone; S. S. Scoville, M. D., two specimens *Orthis scovillei*; Ohio Mechanics' Institute, Proceedings, volume 1, No. 4.

TUESDAY EVENING, *March 6, 1883.*

Dr. R. M. Byrnes, President in the chair. Present, twenty members.

Prof. A. G. Wetherby delivered an address upon the "Relation of Mollusks to Their Shells." He gave an account of the anatomy of the common muscle or *Unio* of our Western rivers. The shells of these mollusks grow generally in the direction of the shorter dimension or diameter, and hence this diameter is called by conchologists the length of the shell, and the longer diameter is the width. The growth of a shell is always from a nucleus, and this nucleus in the univalve shell, to which our common snails belong is a spire. In most shells the spire is elongated, and there is no difficulty in determining which side of the shell is the upper side or spire, but in *Planorbis* the shell is disciform and almost flat, so that the upper side can be satisfactorily determined only by the position of the animal. Prof. Wetherby concludes that the shell in this genus is reversed, and the spire carried with its apex downward, an anomaly in the family of Mollusks.

Mr. A. F. Gray was elected a member of the Society.

Dr. R. M. Byrnes exhibited a specimen of *Stellipora antheloidea*, collected from the Utica Slate Group, within fifty feet of low water mark in the Ohio river opposite the foot of Fifth street.

A resolution was adopted thanking Messrs. F. Speth and Fred. Wagner for their display of microscopes and objects at the Darwin reception, and Mr. Thos. Knott for a beautiful floral decoration for the same occasion.

Donations were announced as follows: From Wm. N. Rice, 1 pamphlet; Arthur F. Gray, 2 pamphlets; Signal Service Bureau, Weather Review for December, 1882; U. S. Geological Survey, Tertiary History of the Grand Canon District, with atlas; Smithsonian Institution, 2 pamphlets; G. M. Austin, 6 species of fossils; Zoological Society, ninth annual report; Missouri Historical Society, 2 pamphlets; sixteen subscribers, a set of 13 volumes of Chas. Darwin's works (these latter were presented to the library at the meeting held in honor of Darwin's birth, on February 23, postponed from February 12; Dr. H. H. Hill, 64 volumes Ohio Geology, etc., 40 vials insects, 20 maps, 1 mounted specimen Great Northern Diver; Miss Janet Knox, specimen Melo diadema.

THE FLOOD IN THE OHIO RIVER.

The rain storms in the valley of the Ohio were excessive in the latter part of January, and early part of February, and happened to be so distributed that the high water in the smaller streams that feed the lower Ohio was permitted to unite with the great volume coming down from the upper Ohio. The consequence was that while the upper Ohio did not reach the height of the freshets of 1847 and 1832, the lower Ohio rose higher than ever known before, always excepting of course the possibility that it did not reach the height of the river of the 18th of March, 1793, described by Dr. Drake in the Transactions of the American Philosophical Society, 2d ser., vol. 2.

For convenience of reference we here record the height of the water from the 1st to the 23d day of February, 1883, at Cincinnati, according to the Water Works mark:

		Ft.	In.
February 1	.....	28	10
" 8	.....	54	
" 9	.....	58	
" 10	.....	59	4 $\frac{3}{4}$
" 11 at 2 o'clock A. M.	.....	59	6
" 12	.....	62	7 $\frac{1}{2}$
" 13	.....	64	5 $\frac{1}{2}$
" 14 at 2 o'clock A. M.	.....	65	0 $\frac{1}{2}$
" 3	.....	65	0 $\frac{1}{4}$
" 4	.....	65	
" 5	.....	64	11 $\frac{1}{2}$
" 6	.....	64	11 $\frac{1}{4}$

			Ft.	In.
February 14, at 7 o'clock A. M.			64	11
"	8	"	64	10 $\frac{3}{4}$
"	9	"	64	10 $\frac{3}{4}$
"	10	"	64	11 $\frac{1}{2}$
"	11	"	65	0 $\frac{3}{4}$
"	12	"	65	1 $\frac{1}{2}$
"	1 o'clock P. M.		65	3
"	2	"	65	4 $\frac{1}{2}$
"	3	"	65	6
"	4	"	65	7 $\frac{3}{4}$
"	5	"	65	9
"	6	"	65	10 $\frac{1}{2}$
"	7	"	65	11 $\frac{1}{2}$
"	8	"	66	0 $\frac{1}{2}$
"	9	"	66	0 $\frac{3}{4}$
"	10	"	66	1 $\frac{3}{4}$
"	11	"	66	2 $\frac{1}{4}$
"	12 midnight		66	2 $\frac{3}{4}$
"	15, at 1 o'clock A. M.		66	3 $\frac{1}{4}$
"	2	"	66	3 $\frac{1}{2}$
"	3	"	66	3 $\frac{3}{4}$
"	4 (highest point)		66	4
"	5	"	66	4
"	6	"	66	3 $\frac{3}{4}$
"	7	"	66	3 $\frac{3}{4}$
"	8	"	66	3 $\frac{1}{2}$
"	9	"	66	3
"	10	"	66	2 $\frac{1}{2}$
"	11	"	66	2 $\frac{1}{2}$
"	12	"	66	1 $\frac{1}{2}$
"	1 o'clock P. M.		66	1
"	2	"	66	0 $\frac{1}{2}$
"	3	"	65	11 $\frac{3}{4}$
"	4	"	65	11 $\frac{1}{4}$
"	8	"	65	8
"	12 midnight		65	3 $\frac{3}{4}$
"	16, at 2 o'clock A. M.		65	1 $\frac{1}{4}$
"	6	"	64	10
"	10	"	64	5 $\frac{1}{2}$
"	12 o'clock M.		64	4 $\frac{1}{2}$
"	4 o'clock P. M.		63	11 $\frac{1}{2}$
"	8	"	63	8
"	12 midnight		63	3
"	17, at 2 o'clock A. M.		64	0 $\frac{1}{4}$
"	8	"	62	7
"	12 " M.		62	4
"	4 " P. M.		61	11 $\frac{1}{2}$
"	8	"	61	8
"	12 midnight.		61	4
"	18, at 2 o'clock A. M.		61	2
"	19	"	59	7
"	20	"	58	3 $\frac{1}{2}$
"	21	"	56	10
"	22	"	54	8
"	23 at 9 o'clock A. M.		50	
"	23 at midnight.		47	9

BIBLIOGRAPHY OF THE CINCINNATI FAUNA.

By DR. F. W. LANGDON.

By way of supplement to our "Synopsis of the Cincinnati Fauna,"* given in a late number of this JOURNAL, we append a local zoological bibliography, which we hope will be found of use to those interested in the fauna of this vicinity. It aims to include the zoological publications relating to this vicinity, with such others as may have a more or less direct bearing thereon. The department of Palæontology is not touched upon, excepting in the case of publications relating to fossil tertiary mammalia. General works are, as a rule, mentioned by title only; more extended notice being given to publications of a strictly local nature.

For valuable assistance in the department of Ornithology, we are indebted to Dr. J. M. Wheaton, of Columbus, Ohio, who has kindly furnished us with advance sheets of his forthcoming "Bibliography of Ohio Ornithology," †which we have largely quoted, especially in the case of Dr. Kirtland's papers, very few of which were accessible to us.

The ornithological portion of the present bibliography, contains *all* the titles given by Dr. Wheaton, in the above mentioned work, with about a dozen additional ones, some of the latter being publications pertaining to adjoining portions of Indiana.

Mr. Charles Dury has contributed the portion relating to the department of Entomology; Mr. A. F. Gray, that on Mollusca; and Dr. J. H. Hunt, that on microscopic Articulata, Coelenterata and Protozoa. There never was a perfect bibliography, and it is not expected that the present one is an exception to the rule; additions and corrections will be thankfully received.

SUBKINGDOM VERTEBRATA.

CLASS MAMMALIA.

1778. HUTCHINS, THOMAS. Topographical description of Virginia, Pennsylvania and North Carolina, comprehending the rivers Ohio, Kanawha, Scioto, Cherokee, Wabash, Illinois, Mississippi, etc. London, 1778.

* This Journal, vol. v., No. 3, Oct., 1882, pp. 185-191.

† In vol. iv. Geological Survey of Ohio, 1882.

Not seen; this notice, from "Allen's History of the American Bison," p. 505, foot-note; mentions buffalo as "innumerable" northwestward of the Ohio river, from the mouth of the Kanawha, far down the Ohio.

1788. MAY, COL. JOHN. Journal and letters of, etc. <Hist. & Philos. Soc. of Ohio, new series, vol. i., pp. 81-83. Mention of buffalo on the Muskingum.

Not seen; title quoted from "Allen's History of the American Bison," p. 505, foot-note.

1808. ASHE, THOMAS. Travels in America, performed in 1806, for the purpose of exploring the rivers Allegheny, Monongahela, Ohio and Mississippi, and ascertaining the produce and condition of their banks and vicinity. By Thomas Ashe, Esq. In three volumes, vols. i. [ii.-iii.], London. Printed for Richard Phillips, Bridge street, by John Abraham, Clement's lane. 1808.

Vol. I.—Reference, p. 95, *et. seq.*, to abundance of buffalo at Onondago Lake, Pa. (attracted by Salt springs). Vol. II.—Deer near Marietta, Ohio, p. 23. There are various other references bearing on Ohio.

1838. ATWATER, CALEB. A history of the State of Ohio, natural and civil. by Caleb Atwater, A.M., member of the American Antiquarian Society; of the Rhode Island Historical Society; of the Lyceum of Natural History of New York; and of the American Geological Society; author of Western Antiquities; Tour to Prairie DuChien, etc. Second edition: Cincinnati; stereotyped by Glazen & Shepard. Title page not dated.

There must be a first edition somewhere, but we have been unable to find it. Under head of "Wild Animals," etc., pp. 67-70, mentions bear, black and yellow wolf, and the panther and the black and gray fox;" also beaver, otter, elk and bison, along with the common species.

1838. BRIGGS, JR., C. Report of (on counties of Wood, Crawford, Athens, Hocking and Tuscarawas.) <Second Annual Report on the Geological Survey of the State of Ohio, by W. W. Mather, principal geologist, and the several assistants. Columbus. Samuel Medary, printer to the State, 1838, pp. 109-154.

Contains references, with weights and measurements (pp. 127-129), to various bones of a Mastodon found near Bucyrus in 1838.

1838. FOSTER, J. W. Report of (on counties of Muskingum, Licking and Franklin). <Op. cit.

Contains (pp. 79-83) the original description, illustrated, of the giant beaver (*Castoroides ohioensis*), and references to other fossil mammalian remains found near Nashport, Ohio.

1838. KIRTLAND, J. P. Report on the Zoology of Ohio, by Prof. J. P. Kirtland, M.D. <Second Annual Report on the Geological Survey of the State of Ohio. By W. W. Mather, principal geologist, and the several assistants. Columbus. Samuel Medary, printer to the State, 1838, pp. 157-200.

The first systematic work on Ohio Zoology. Contains catalogues of mammals, birds, reptiles, fishes, crustaceans, and mollusks, found in Ohio; enumerating, under mammals, 50 species; birds, 223 species; reptiles (proper) 27 species; batrachians, 21 species; fishes, 72 species; crustaceans, 2 species; mollusks, 169 species.

Twenty-five pages following the catalogues proper, are occupied with notes on various species, amongst which occur numerous references to specimens taken in the vicinity of Cincinnati.

The list of mammals is a nominal one of fifty species, three of which are synonyms; and a fourth, the European *Arvicola amphibus*, is included either through misinformation or error in identification. Short notes on thirty-three species are given in an appendix, entitled "Notes and Observations."

- 1846-48. CROGHAN, GEORGE. Journal of George Croghan. <The Olden Time; a monthly publication devoted to the Preservation of Documents and other Authentic Information in relation to the Early Explorations, and the Settlement and Improvement of the country around the head of the Ohio. Edited by Neville B. Craig, Esq. Two volumes, small 4to, Pittsburgh, 1846-1848.

Not seen; this notice, from "Allen's History of the American Bison," p. 505, foot-note. Various references to buffalo in Ohio, in 1765. This same periodical contains numerous other references to buffalo between 1770 and 1785.

1848. HILDRETH, S. P. Pioneer History: being an account of the first examinations of the Ohio Valley, and the early settlement of the Northwest Territory, chiefly from original manuscripts; containing the papers of Col. George Morgan; those of Judge Barker; the diaries of Joseph Buell and John Mathews; the records of the Ohio Company, etc., etc., etc., by S. P. Hildreth. Cincinnati: H. W. Derby & Co., Publishers. New York: A. S. Barnes & Co. 1848.

Reference to deer (and turkeys), p. 358; to deer and buffalo, p. 485; panther (at Belpre, 1794-5), p. 497; wolves, beaver, p. 498. Records last beaver seen "on Muskingum, near Captain Devoll's mill, about the year 1805, and was trapped by Israel Williams."

1848. HOWE, HENRY. Historical Collection of Ohio, containing a collection of the most interesting facts, traditions, biographical sketches, anecdotes, etc., relating to its General and Local History: with descriptions of its counties, principal towns and villages. Illustrated by 177 engravings, giving views of the chief towns, public buildings, relics of antiquity, historic localities, natural scenery, etc., by Henry Howe. Great Seal of the State of Ohio (1802). Cincinnati: Published for the author by Bradley & Anthony; price three dollars. 1848.

Reference to bear, 47, 572; Mastodon remains, 118, 264; wolves, 47, 243, 275, 280, 366.

1851. AUDUBON, J. J., and BACHMAN, JOHN. Quadrupeds of North America, etc., vol. ii.

Refers to buffalo in Indiana and Kentucky, at p. 36.

1854. TAYLOR, W. History of the State of Ohio, by James W. Taylor. First period, 1650-1787. Cincinnati: H. W. Derby & Co., Publishers. Sandusky: C. L. Derby & Co. 1854.

Quotes from Drake's "Indian Captivities," in reference to deer, bear, and raccoons, p. 91; bears, p. 112; buffalo, p. 88, etc.

1855. DRAKE, S. G. Indian Captivities, or Life in the Wigwam, being true narratives of Captives who have been carried away by the Indians from the frontier settlements of the United States, from the earliest period to the present time. By Samuel G. Drake, author of the "Book of Indians." New York and Auburn: Miller, Orton & Mulligan. New York: 25 Park Row. Auburn: 107 Genessee St. 1855.

Beaver and deer on Muskingum, pp. 208-210; buffalo and elk, same locality, pp. 188-9; buffalo, 228; bears, near Sandusky, 232, etc.

1869. HAYMOND, RUFUS. Mammals found at the present time in Franklin county, Indiana. <First Annual Report of the Geological Survey of Indiana, made during the year 1869, by E. T. Cox, State Geologist, assisted by Prof. Frank H. Bradley, Dr. Rufus Haymond, and Dr. G. M. Levette, Indianapolis. Alexander H. Conner, State printer, 1869, pp. 203-208.

Classified list of thirty species. Gives *Lynx rufus* and *Hystrix hudsonius* as present, but rare. Remarks that the red fox, *Vulpes fulvus*, has only been observed in that country within ten or fifteen years. Records 1827 as the date when Norway rat first appeared in Brookville, Ind., and states that the black rat (*Mus. rattus*) was "numerous" at that time, but were "all gone" in a year or two—"all eaten up by this predatory stranger" (the Norway rat).

1869. HAYMOND, RUFUS. Geology of Franklin county, Indiana. Dr. Rufus Haymond's report of a geological survey of Franklin county, Indiana, made during the summer and fall of 1869. <First Annual Report of the Geological Survey of Indiana, made during the year of 1869, by E. T. Cox, State Geologist, assisted by Prof. Frank H. Bradley, Dr. Rufus Haymond, and Dr. G. M. Levette, Indianapolis. Alexander H. Collins, State printer, 1869.

Mention at pp. 199-200, of parts of skeletons of three Mastodons, and a "tooth or two" of the Mammoth, near Brookville, Indiana.

1874. MILLER, S. A. (Editor.) Ancient Relics found in Cincinnati. <Cincinnati Quarterly Journal of Science, vol. i., No. 10, October, 1874, pp. 375-377.

Mentions "bear's tusks," "wolf's teeth," "deer's horns," etc., found by Dr. H. H. Hill, in excavating some aboriginal graves on hill back of Brighton House, Cincinnati, O.

1875. KLIPPART, JOHN H. Discovery of *Dicotyles (Platygonus) compressus*, LeConte. By John H. Klippart, of Columbus, Ohio. <The Cincinnati Quarterly Journal of Science, vol. ii., No. 1, January, 1875, pp. 1-6. (Read before A. A. A. S., Hartford meeting, August, 1874.)

Account of discovery of several skeletons of an extinct species of peccary, at Columbus, Ohio.

1875. KLIPPART, JOHN H. Mastodon remains in Ohio, by John H. Klippart. <The Cincinnati Quarterly Journal of Science, vol. ii., No. 2, April 1875, pp. 151-155.

Notice of finding of Mastodon bones in various parts of Ohio; of *Castor ohioensis*, near Nashport; of *Dicotyles (Platygonus) compressus* (12 skeletons), at Columbus; of a jaw of fossil horse, at Columbus.

1876. JORDAN, D. S. Manual of the Vertebrates of the Northern United States, including the district east of the Mississippi river, and north of North Carolina and Tennessee, exclusive of marine species, by David Starr Jordan, M.S., M.D., etc. Chicago: Jansen, McClurg & Co. 1876.

The title sufficiently explains the scope of the book, which is one of the most useful works of the kind extant. Diagnoses of the various orders, families, genera, and species in each class, are given with brief references to general geographical distribution. A second edition, dated 1880, has appeared.

1877. ALLEN, J. A. History of the American Bison (*Bison ameri-*

canus). By J. A. Allen. <Ninth Annual Report of the United States Geological and Geographical Survey of the Territories, embracing Colorado and parts of adjacent Territories : Being a Report of Progress of the Exploration, for the year 1875. By F. V. Hayden, United States Geologist. Conducted under the authority of the Secretary of the Interior. Washington: Government Printing Office. 1877. Part iii., Zoology, pp. 441-587.

The work is substantially a republication of "The American Bisons, Living and Extinct," by the same author, which originally appeared in Vol. 1, Part ii., of the "Memoirs of the Geological Survey of Kentucky," etc., 1876. Also published under title of "Memoirs of the Museum of Comparative Zoology," etc., Cambridge, Mass., vol. iv., 1876, etc. In the reprint which forms the subject of this notice, the extinct species are not treated, illustrations are omitted, and there are numerous minor modifications and additions. There are a few editorial explanatory notes by Dr. Elliot Coues. The limited number of copies of the original edition makes the one here noticed practically the only full history of the American buffalo accessible to the general public. References to the buffalo in the Ohio valley occur at pp. 458, *et seq.*; in Ohio, at p. 474 (southern shore of Lake Erie), p. 499, 505, etc.; in Kentucky, p. 504.

1881. EDITOR [F. W. LANGDON]. *Canis lupus*, *Lutra canadensis*, *Cariacus virginianus*, *Atalapha cinereus*, *Sciurus carolinensis leucotis*, *Sciurus niger ludovicianus*, *Tamias striatus*, *Lepus sylvaticus*.

Notes on above species in Ohio and Indiana.

1881. JONES, HOWARD E. *Arctomys monax*, Schreber. <Journal Cin. Soc. Nat. Hist., vol. iv., p. 337.

Note on arboreal habits of woodchuck.

1881. LANGDON, F. W. The Mammalia of the vicinity of Cincinnati. A list of species, with notes. <Journal Cin. Soc. Nat. Hist., vol. iii., pp. 297-313.

Three lists, lettered respectively, "A," "B," and "C." "A" is a list of 44 identified species; "B," a list of 10 unidentified species, whose range includes this locality; "C," a list of 6 extinct species, whose fossil remains have been found in Ohio.

1881. QUICK, E. R. *Hesperomys leucopus*, Leconte. <Journal Cin. Soc. Nat. Hist., vol. iv., p. 337.

Albino specimen taken at Brookville, Ind.

1882. BRAYTON, A. W. Report on the Mammals of Ohio. By Albert W. Brayton, M.D. <Report of the Geological Survey

of Ohio. Vol. iv. Zoology and Botany. Part 1. Zoology. Officers of the Survey: J. S. Newberry, Chief Geologist; E. B. Andrews, Assistant Geologist; Edward Orton, Assistant Geologist; T. G. Wormley, Chemist; F. B. Meek, Palæontologist; J. M. Wheaton, A. W. Brayton, R. C. Beardslee, D. L. Jordan, W. H. Smith, R. M. Byrnes, Special Assistants in Zoology and Botany.—Published by authority of the legislature of Ohio. Columbus: Nevins & Myers, State printers, 1882. Section I. Report on the Mammalia of Ohio, by A. M. (*sic.*) Brayton, pp. 1-185; Addenda, pp. 171, *et seq.* Duplicate title, "Report on the Mammals of Ohio," by A. M. (*sic.*) Brayton.

A good account, largely compiled, as stated in preface, from standard authorities on North American Mammals. The work treats of 48 species, and aims to include extirpated as well as existing species. The extinct tertiary mammals are not mentioned. The accounts of the various species are well prepared, and a feature of special interest is the full synonymy which precedes the account of each. *Spermophilus franklini* is given at p. 118-119, on the authority of the present writer; this is an error which has since been corrected (*vide* LANGDON, Mammalia of the Vicinity of Cincinnati, etc., this JOURNAL, vol. iii., p. 305, foot-note). It is also corrected at p. 1002 of the volume which forms the subject of this sketch.

1882. EDITOR [F. W. LANGDON]. A Synopsis of the Cincinnati Fauna. <Journal Cin. Soc. Nat. Hist., vol. v., p. 185.

"Class Mammalia." A table of the species, genera, families, and orders of mammalia, identified in the vicinity of Cincinnati; also a table of "probabilities" not yet identified.

1882. QUICK, E. R. Arvicola riparius, Ord. <Journal Cin. Soc. Nat. Hist., vol. v., p. 52.

Measurements four specimens from Brookville, Ind.

1882. QUICK, E. R. Mammals found in Franklin county [Indiana.] <Atlas of Franklin county, Indiana. To which are added various general maps, history, statistics, illustrations, etc. J. H. Beers & Co., publishers, Lake Side Building, cor. Clark and Adams streets, Chicago, 1882. Folio (?).

Mammals begin on page 9, and end on page 10. The work comprises civil, religious, political, military and natural history of the county.

(Not seen; this notice from memoranda furnished by Mr. E. R. Quick.)

1882. RICKETTS, B. M. Lynx rufus, Rafinesque. <Journal Cin. Soc. Nat. Hist., vol. v., p. 52.

Captured near Hanging Rock, O.

1882. SIEWERS, C. G. *Sciuropterus volucella*, Geoffroy, *Felis domesticus*, L. < Jour. Cin. Soc. Nat. Hist., vol. v., pp. 92-93.

Depredations of former on pea-crop checked by latter.

1882. SHORTEN, J. W. *Blarina brevicauda*, Baird. < Journal Cin. Soc. Nat. Hist., vol. v., p. 93.

Specimen found in stomach of *Buteo borealis*.

CLASS AVES.

- 1808-14. WILSON, A. American Ornithology; or, the Natural History of the Birds of the United States: Illustrated with plates engraved and colored from original drawings taken from nature, by Alexander Wilson. Vol. i. [-ix.] Philadelphia: Published by Bradford and Inskip.

- 1825-33. BONAPARTE, C. L. American Ornithology; or, the Natural History of Birds inhabiting the United States, not given by Wilson, with figures drawn, engraved, and colored, from nature. By Charles Lucien Bonaparte. Vol. i. [-iv.] Philadelphia: Carey, Lea & Carey, Chestnut street. London: John Miller, 40 Pall Mall.

- 1831-39. AUDUBON, J. J. Ornithological Biography, or an account of the habits of the Birds of the United States of America; accompanied by descriptions of the objects represented in the work entitled the Birds of America, and interspersed with delineations of American scenery and manners. By John James Audubon, F. R. S. S. L. & E. Edinburgh: Adam Black. MDCCCXXXI-II., etc.

This is the original edition of text to Audubon's great work, "The Birds of America," and contains several references to birds observed in the vicinity of Cincinnati, *e. g.*, *Coturniculus henslowi* ("Kentucky, opposite Cincinnati"), *Hedymeles ludovicianus* (breeding), *Comurus carolinensis*, *Cathartes atratus*, *Ardeetta exilis*, *et. al.* There are several reprints of the work.

- 1832-34. NUTTALL, T. A Manual of the Ornithology of the United States and of Canada. By Thomas Nuttall, A. M., F. L. S. [Vol. i.] The Land Birds. Cambridge: Hilliard & Brown, booksellers to the University. MDCCCXXXII. [Vol. ii.] The Water Birds. Boston: Hilliard, Gray & Company. MDCCCXXXIV.

1838. ATWATER, CALEB. A History of the State of Ohio, natural and

civil. By Caleb Atwater, A. M., Member, etc., etc. First edition. Cincinnati, pp. 93-96.

Mentions by common name, and sometimes very indefinitely, about seventy-five species of birds. Notes the sandhill crane on the Scioto nearly all the year; paroquette, as quoted on page 404; closes with a highly laudatory and histrionic description of the brown thrush, and his vocal powers.—(Wheaton.)

1838. ATWATER, CALEB. History of Ohio, second edition. Cincinnati, 1838.

Refers to raven (*Corvus corax carnivorus*), as a constant resident of the State. Sandhill crane, parakeet, and about 70 other species mentioned.

1838. KIRTLAND, JARED P. Report of Dr. Kirtland, Second Assistant Geologist. <First Annual Report on the Geological Survey of the State of Ohio. By W. W. Mather, Principal Geologist, and the several assistants. Columbus: Samuel Medary, printer to the State. 1838, pp. 65-69.

Presents the plan and economic importance of the Zoological Survey of the State. Names *Meleagris gallopavo*, *Anas domestica*, *Anas canadensis*, *Anas bernicla*, *Anas americana*, *Anas obscura*, *Anas sponsa*, *Anas discors*, *Anas crecca*, *Fuligula vallisneria*, *Fuligula ferina*, *Tetrao cupido*, *Tetrao umbellus*, *Perdix virginiana*.—(Wheaton.)

1838. KIRTLAND, J. P. Report on the Zoology of Ohio. By Professor J. P. Kirtland, M. D. <Second Annual Report on the Geological Survey of the State of Ohio. By W. W. Mather, Principal Geologist, and the several assistants. Columbus: Samuel Medary, printer to the State, pp. 160-6, and 177-187.

The list of birds is a nominal one of 222 (223 by error in numbering) species, and is supplemented by notes on 124 species. This work is the first systematic treatise on Ohio Ornithology, and, considering the time and circumstances of its appearance, is remarkable for its fullness and comparative freedom from errors. The work contains numerous references to birds observed in the vicinity of Cincinnati, and our only authentic records of the occurrence here of the avocet, and Hudsonian godwit.

- 1840-44. AUDUBON, J. J. The Birds of America, from drawings made in the United States and their Territories. By John James Audubon. Philadelphia: J. B. Chevalier. 1840-1844, 7 vols.

1841. KIRTLAND, J. P. Fragments of Natural History. By J. P. Kirtland, M.D., Prof. Theo. and Prac. Phys. Medical College of Ohio. "I write that which I have seen." LeBaum. No. II., Ornithology. <Am. Jour. Sci. and Arts, vol. xl., 1841, pp. 19-24.

Desultory notes on seventeen species, dated June 4, 1840. *Bombycilla garrula*, *Phalaropus hyperboreas*, *Sylvia pensilis*, *S. rara*, *Fringilla ludoviciana* (*S. trochilus*), *Florida gallinule*, *Tringa rufescens*, *Tringa alpina*, *Sylvia maritima*, *S. icterocephala*, *S. castanea*, *Totanus semipalmatus*, *Limosa fedoa*, *Numenius hudsonicus*, *Charadrius melodus*.

1845. STORER, D. H. [Occurrence of *Fringilla pinea* [*pinus*], and *Bombycilla garrula*, in Ohio, in July.] <Proc. Bost. Soc. Nat. Hist., vol. ii., 1845, p. 52.

Statement as above in letter from Dr. J. P. Kirtland.

1850. KIRTLAND, J. P. Fragments of Natural History. <Family Visitor (weekly newspaper), vol. 1, No. 1, 1850-1.

Notes on twenty-one species, chiefly regarding their relative abundance compared with former years. Washington eagle, red-tailed, red-shouldered, broad winged, Cooper's and swallow tailed hawks, gossander, mallard, summer duck, wild turkey, partridge, quail, pileated woodcock, turkey buzzard, raven, crow, crow black bird, robin, blue bird, thrush, cat bird.—(Wheaton.)

1850. [KIRTLAND, J. P.] The Eagle. <Family Visitor, No. 2, 1850, p. 15.

Golden eagle, an occasional visitor; Washington eagle, a doubtful species; white headed eagle, breeding in Rockport, Ohio.

1850. [KIRTLAND, J. P.] The Blue Bird. <Family Visitor, vol. i., No. 7, 1850, p. 55.

A popular account.

1850. [KIRTLAND, J. P.] Birds of Winter. <Family Visitor, vol. i., No. 8, 1850, p. 63.

1850. [KIRTLAND, J. P.] Troupial or Cow Blackbird. <Family Visitor, vol. i., No. 9, 1850, p. 71.

1850. J. P. K. [KIRTLAND]. Editorial Correspondence. <Family Visitor, vol. i., No. 10, 1850, p. 72.

Domestication of the summer duck, and other water fowl.

1850. [KIRTLAND, J. P.] Instinct. <Family Visitor, vol. i., No. 15, 1850, p. 120.

Owing to late season, redpolls and white snow birds remain until April, the latter in breeding plumage.

1850. [KIRTLAND, J. P.] The Wild Pigeon. <Family Visitor, vol. i., No. 17, 1850, p. 133.

A popular account.

1850. [KIRTLAND, J. P.] Pine Linnet. <Family Visitor, vol. i., No. 18, 1850, p. 140.
Fringilla linaria, arriving July 1, and remaining until May 30.
1850. [KIRTLAND, J. P.] White-crowned and White-throated Finches. <Family Visitor, vol. i., No. 19, 1850, p. 148.
 Remaining till June 1.
1850. [KIRTLAND, J. P.] Pine Finch. <Family Visitor, vol. i., No. 19, 1850, p. 148.
 Still remains (June 29) and mating.
1850. [KIRTLAND, J. P.] White-headed Sparrow. <Family Visitor, vol. i., No. 19, 1850, p. 148.
 Still remains (June 27).
1850. [KIRTLAND, J. P.] White-headed Eagle. <Family Visitor, vol. i., No. 19, 1850, p. 148.
 Nesting at Rockport, Ohio, in 1850.
1850. [KIRTLAND, J. P.] The Glossy Ibis. <Family Visitor, vol. i., No. 21, 1850, p. 164.
 Copies account in Boston Traveler (May ?) 28th, one specimen recently taken near Cambridge, and one at Middleboro, Mass., and one at Middletown, Conn., and records two specimens of the *Glossy Ibis* two years previously (1848) near Fairport, Lake county, Ohio, one captured. Also records taking of Wilson's phalarope and great marbled godwit by the same collector.—(Wheaton).
1850. [KIRTLAND, J. P.] White-throated and White-headed Sparrow. <Family Visitor, vol. i., No. 21, 1850, p. 164.
 Remained at Sandusky until June [July] 3; pine linnet still remains [July 11.]
1851. [KIRTLAND, J. P.] A Rare Bird. <Family Visitor, vol. i., 1851, p. 412.
Troglodytes ludovicianus taken at Rockport, Ohio, April 30, 1851.
1852. BAIRD, S. F. Description of a new species of *Sylvicola*. *Sylvicola kirtlandii*. <Ann. Lyc. N. Y., vol. v., 1852, p. 217.
1852. KIRTLAND, J. P. Peculiarities of the Climate, Flora and Fauna of the South Shore of Lake Erie, in the vicinity of Cleveland, Ohio; by J. P. Kirtland. <Am. Jour. Sci. and Arts, 2d Series, vol. xiii., 1872, pp. 215-19. Reprinted in Proc. Cleveland Acad. Nat. Sci., 1874, 1875, p. 171, and in Family Visitor, 1851-2.

Notes on the hooded, Kentucky, yellow-throated wood, cerulean and prairie warblers, Traill's flycatcher, piping plover, pine grosbeak, white owl, Bohemian wax-wing, and pine finch.

1852. [READ, M. C., Editor.] The Cow Blackbird. <Family Visitor, vol. iii., No. 9, 1852, p. 68.

List of 18 species foster parents of the cow blackbird; snowbird (*Junco*) and chestnut-sided warbler, breeding in Ashtabula county, Ohio.

- 1852-3. [READ, M. C.] Birds of Ohio. <Family Visitor, vol. iii., 1852.

The first systematic attempt to describe the birds of the State. Ordinal, family, generic, and specific descriptions, with notes on habits of about a dozen families are given. No choice is expressed as to specific nomenclature, several synonyms being sometimes given. Species, 74—2 synonyms—76—(Wheaton).

1853. READ, M. C. Catalogue of the Birds of Northern Ohio. <Proc. Acad. Nat. Sci. Phila., vol. vi., 1853, pp. 395-402.

Shortly annotated list of 146 species; land birds only. Marked "to be continued." No continuation found. (Not seen; this notice is taken from Coues' *Bibliographical Appendix to Birds of Colorado Valley*.)

1854. ZUCHOLD, —. <Journal für Ornithologie, vol. vi., 1854, p. 355.

Copies Baird's description of *Sylvicola kirtlandi*. (See 1852, Baird.)

1856. CASSIN, J. Illustrations of the Birds of, etc., etc., vol. i., p. 278. Pl. xlvii. Philadelphia, 1856.

Sylvicola kirtlandi from the original.

1856. HAYMOND, RUFUS. Birds of Southeastern Indiana. <Proc., Acad. Nat. Sci., Phil., vol. viii., 1856, pp. 286-298.

Classified list of 139 species with notes. Contains the first record of the occurrence of the wood ibis, *Tantalus loculator*, in this vicinity.

1858. BAIRD, SPENCER F. Birds. <[Pacific R. R. Report.], vol. ix., 1858.

Mentions several specimens of Ohio birds in the National Museum, *Vireo philadelphicus*, *Empidonax minimus*, etc.

1859. BREWER, T. M. North American Oology. <Smithsonian Contributions, vol. xi., 1859.

Names seven species of Raptores as Ohioan.

1859. KIRKPATRICK, JOHN. Birds of Ohio. <Ohio Farmer (newspaper, Cleveland), 1859.

A short account, chiefly a compilation of 59 species of Ohio birds. Four species added to fauna of State.

1859. KIRKPATRICK, JOHN. Rapacious Birds of Ohio. <Ohio Agric. Report for 1858 [1859], pp. 341-383.
Reprint of Raptores from the Birds of Ohio, Ohio Farmer (above).
1860. KIRTLAND, J. P. An Addition to the Fauna of Ohio. <Ohio Farmer, vol. ix., 1860, p. 91.
Notice of occurrence of *Hesperiphona vespertina*, new species to State, and comments on rarity of various birds during the winter.
1860. ANON. [KIRKPATRICK, JOHN.] Kirtland's Warbler. <Ohio Farmer, vol. ix., 1860, p. 179.
Note of a specimen of *Dendreca kirtlandi*, taken by Mr. Darby, at Cleveland, in the spring of 1860.
1861. COLLINS, W. O. Report of Senate Select Committee, upon Senate Bill No. 12, "For the Protection of Birds and Game." <Fifteenth Ann. Rep. Ohio State Board of Agriculture for 1860 (1861), pp. 381-390.
Facts in the natural history of Ohio birds, with recommendations for legislative action.
1861. EDITOR [S. D. HARRIS]. Field Notes, vol. i, 1861, p. 65.
Note on the introduction of the English skylark, at Columbus, in 1851.
1861. TREMBLY, J. B. Bird Talk. <Field Notes [Agricultural newspaper, Columbus, O.] Vol. i., 1861, p. 65.
Note on *Picus pileatus* as observed about Toledo.
1861. TREMBLY, J. B. Ornithological Inquiries. <Field Notes, vol. i., 1861, p. 129.
Larus occidentalis (= *argentatus*, immature), *L. bonapartei*, *Sterna hirundo*, at Toledo, in April.
1861. TREMBLY, J. B. Gulls. <Field Notes, vol. i., 1861, p. 180.
Continued discussion of so-called *L. occidentalis*, with interesting notes upon the breeding habits of the Florida gallinule, and upon *Ardeetta exilis* and *Botaurus lentiginosus*.
1861. WHEATON, J. M. Bird Notes. <Field Notes. vol. i., 1861, p. 65.
Note on distribution of pileated woodpecker, whipporwill, nighthawk and shore lark.
1861. WHEATON, J. M. Rare Birds. <Field Notes, vol. i., 1861, p. 153.
Notes on the capture at Columbus, in May, of *Porzana carolina*, *Rallus virginianus*, *Guiraca ludoviciana*, *Ardeetta exilis*, *Gallinula galeata*, and *Chondestes grammacus*. Latter species added to fauna of State.

1861. WHEATON, J. M. Ornithological Inquiries. <Field Notes, vol. i., 1861, p. 152.

Suggestions as to proper identification of *L. occidentalis* (above), and hints towards laws of migration.

1861. WHEATON, J. M. Catalogue of the Birds of Ohio. <Fifteenth Ann. Rep. Ohio State Board of Agric. for 1860 [1861], pp. 359-398. Addenda, p. 480.

285 species, with 17 "probabilities;" the rarer or more interesting species fully annotated. Includes p. 381, *et seq.*, reports of legislative action for protection of birds. Also printed separately, repaged, without the legislative reports.

(This notice from Coues' Bibliog. Appendix to Birds of Colorado Valley.

1861. WHEATON, J. M. Catalogue of the Birds of Ohio. Reprinted from the Ohio Agricultural Report for 1860 (1861), pp. 1-21.

Reprint of the last, repaged, and with its addenda distributed in place; 3 species added to list of probabilities.

1864. BAIRD, S. F. Smithsonian Miscellaneous Collections, 181. Review of American Birds in the Museum of the Smithsonian Institution. By S. F. Baird. Part I. North and Middle America. Washington. Smithsonian Institution.

P. 23. First mention of *Turdus aliceae* from Ohio.

1864. HOUGH, F. B. House of Representatives, 36th Congress, 1st Session, Ex. Doc. No. 55. Results of Meteorological Observations made under the direction of the United States Patent Office and Smithsonian Institution, from the year 1854-1859, inclusive, being a report of the Commissioners of Patents, made at the first session of the Thirty-sixth Congress. Vol. ii., Part 1. Washington. Government Printing Office, 1864. Observations upon Periodical Phenomena in Plants and Animals, from 1851 to 1859, with tables of dates of opening and closing of Lakes, Rivers, Harbors, etc. Arranged by Franklin B. Hough, M. D. Dates of first appearance of Birds, pp. 183-206.

Tables of dates of spring appearance of *Turdus migratorius*, *Mimus felix*, *Sialia sialis*, *Troglodytes aedon*, *Hirundo horreorum*, *Progne purpurea*, *Dolichonyx oryzivorus*, *Agelaius phoeniceus*, *Quiscalus versicolor*, *Tyrannus intrepidus*, *Tyrannula fusca*, *Antrostomus vociferus*, *Chatura pelagica*, *Pandion carolinus*, and *Bernicla canadensis*, at the following stations: Cincinnati, Mt. Healthy, Ripley, Hockingport, Marietta, Hamilton, Germantown, Troy, Belle Centre, Savannah, Bowling Green, Hiram, Edinburg, Windham, Poland, Cleveland, Rockport, Madison, Welchfield, Jefferson and Ashtabula.

1867. BREWER, T. M. Some errors regarding the habits of our Birds. By T. M. Brewer, M. D. <The American Naturalist, vol. i., 1867, p. 113.
Corrects error in "North American Oology," respecting the breeding of *Astur atricapillus*, in Ohio.
1868. GARLICK, T. Migrations of Birds. <Am. Naturalist, vol. ii., 1868, p. 492.
Observation on an Albino robin at Cleveland.
1868. MARCH, P. G. Kingfisher's Nest again. <Am. Naturalist, vol. ii., 1868, p. 490.
Description of two Ohio nests of this bird.
1869. HAYMOND, RUFUS. Birds of Franklin County, Indiana. <First Annual Report of the Geological Survey of Indiana, made during the year 1869, by E. T. Cox, State Geologist, assisted by Prof. Frank H. Bradley, Dr. Rufus Haymond, and Dr. G. M. Levette, Indianapolis: Alexander H. Conner, State printer, 1869, pp. 209-235. This is the title of the Geological volume when bound separately. Some copies are bound with the Agricultural Report for same year, and the volume entitled, Indiana Agricultural and Geological Reports, 1869, etc.
List of 163 species (including *Haliaeetus washingtonii*), with notes. Contains records of the ivory-billed woodpecker, swallow-tailed kite, Bewick's wren, turnstone, Brantgoose (?) greater scaup duck, and velvet duck (*Oedemia fusca*). Also, records of the raven, parakeet and wood ibis. *Graculus carbo* is recorded probably by mistake for *G. dilophus floridanus*.
1869. INGERSOLL, ERNEST. Variation of Bluebird's Eggs. <Am. Naturalist, vol. iii., 1869, p. 391.
Pure white eggs of bluebird, at Oberlin, Ohio.
1872. COPE, E. D. Zoological Sketch of Ohio. By E. Cope, A.M., Sec. Acad. Nat. Sci., Phila. <New Typographical Atlas of the State of Ohio, with descriptions, Historical, Scientific, and Statistical, together with maps of the United States and Territories. By. H. F. Walling and O. W. Gray, Civil Topographical Engineers. Published by Stedman, Brown & Lyon. Cincinnati, 1872.
Gives the number of Ohio birds as 263, grouped as follows: passeræ, 132; syndactyli, 5; scansores, 12; psittaci, 1; raptores, 25; pullastræ, 2; gallinæ, 4; grallæ, 45; natatores, 37. Short notes on a few of the commoner species, p. 25.

1872. COUES, ELLIOTT. Key to North American Birds : containing a concise account of every species of living and fossil bird at present known, from the continent north of the Mexican and United States boundary. Illustrated by 6 steel plates, and upwards of 250 woodcuts. By Elliott Coues, Assistant Surgeon, United States Army. Salem : Naturalists' Agency. New York : Dodd and Mead. Boston : Estes and Lauriate 1872.

Mentions several species as Ohioan, and on page 263, *Tantalus loculator* "north to Ohio."

1872. MAYNARD, C. J. A Catalogue of the Birds of Coos Co., N. H., and Oxford Co., Me., with annotations relative to their breeding habits, migrations, etc. By C. J. Maynard. With notes by William Brewster. <Proc. Boston Soc. Nat. Hist., vol. xiv., for Oct., 1871, pub. 1872, pp. 356-385.

Dendroica castanea noted as occurring in Ohio, p. 366.

1874. BAIRD, BREWER and RIDGWAY. A History of North American Birds. By S. F. Baird, T. M. Brewer, and R. Ridgway. Land Birds Illustrated by 64 colored plates and 593 woodcuts. Vol. i. [—iii.] Boston: Little, Brown & Co., 1874.

Names several birds as occurring in Ohio, and vol. ii., p. 531, first authentic record of *Picoides arcticus* as Ohioan.

1874. COUES, ELLIOTT. Department of the Interior. United States Geological Survey of the Territories. F. V. Hayden, U. S. Geologist-in-charge. Miscellaneous Publications No. 3. Birds of the Northwest: a Hand-book of the Ornithology of the Region drained by the Missouri river and its Tributaries. By Elliott Coues, Captain and Assistant Surgeon U. S. Army. Washington: Government Printing Office. 1874.

Mentions several species as Ohioan, with notes.

1874. KIRTLAND, J. P. Peculiarities of Climate, Flora and Fauna of the South Shore of Lake Erie, in the vicinity of Cleveland, Ohio. <Proc. Cleveland Acad. Nat. Sci., 1874, pp. 200-287.

Read 1851, and originally published, as above, in *Am. Journ. Sci.*, vol. xiii., 1852, also in *Family Visitor*, 1853 (?).

1874. KIRTLAND, J. P. Mounted Birds from Northern Ohio, in the Academy's Museum. <Proc. Cleveland Acad. Nat. Sci., 1874, pp. 200-287.

"The article includes only the *Accipitres* and a few *Incessores*, but is quite full, as far as it goes, with characters of the genera, and higher groups, and descriptions and biographies of the species. It is annotated by Thomas Brown, editor of the *Ohio Farmer*, in which the descriptions originally appeared, and was prepared in 1858-9." Coues' Bibliographical Appendix, Birds Col. Val., 1878, pp. 705.

"This I think is an error, probably on the part of the editors of Proc. Cleve. Acad. Nat. Sci. The paper in question is undoubtedly a reprint of 'The Birds of Ohio,' by John Kirkpatrick, *Ohio Farmer*, 1868-9-71. No article with the above title, or any extended ornithological paper by Dr. Kirtland, appeared in the *Ohio Farmer*, at any time. The Editor was not an ornithologist." Wheaton, Bibliography of Ohio Ornithology, Ohio Geol. Survey, vol. iv., 1882 (in press).

1874. KIRTLAND, J. P. Letter from, dated 1857, mentioning various Indiana Birds. <Proc. Cleveland Acad. Nat. Sci., 1874, pp. 131-132.

Not seen; quoted from Coues' "Bibliographical Appendix" to Birds of Colorado Valley.

1874. RIDGWAY, ROBERT. Catalogue of the Birds ascertained to occur in Illinois. <Ann. Lyc. Nat. Hist., N.Y., vol. x., 1874, pp. 364-394.

Incidentally names a few species as Ohioan, probably on earlier Ohio authorities.

1874. TENNER, ARMIN. [List of 20 species birds imported and set free at Cincinnati by Acclimation Society of Cincinnati.] <Forest and Stream, June 4, 1874.

1874. WHEATON, J. M. Notes. <Birds of the Northwest, 1874, pp. 223-4.

Notes on *Turdus swainsoni*, *T. aliciae*, *Dendroica cerulea*, *D. dominica*, *Amphispiza cedrorum*, *Vireo philadelphicus*, *Collurio ludovicianus*, *Melospiza melodia*, *Chondestes grammacus*, *Chordeiles popetue*, *Chaetura pelasgia*.

1875. WHEATON, J. M. The Food of Birds, as related to Agriculture. <Ohio Agricultural Report for 1874 (1875), pp. 561-578 (Sept. 1875). Also reprint, repaged, but otherwise unchanged, pp. 1-18.

"This is in effect a corrected and completed list of the birds of Ohio, briefly annotated, and with the general food regimen of each family given; being a well-conceived essay of much practical utility." Coues' Bibliographical Appendix, Birds of Colorado Valley, 1878, pp. 716.

288 species, with 6 additional varieties, given.

- 1876 HENSHAW, H. W. On two Empidonaces, *traillii*, and *acadicus*. <Bulletin of the Nuttall Ornithological Club, vol. i., 1876, pp. 14-17.

Description of nest of *E. traillii*, from Ohio, and notes of both species in Ohio.

1876. JORDAN, D. S. Manual of the Vertebrates of the Northern United States, including the district east of the Mississippi river, and north of North Carolina and Tennessee, exclusive of marine species. By David Starr Jordan, Ph. D., M. D., Professor of Natural History in N. W. C. University, and in Indiana State Medical College. Chicago: Jansen, McClurg & Co., 1876.

Several references to Ohio. A second edition is dated 1880.

1877. DURY, CHARLES. Fecundity of the Carolina Wren (*Thryothorus ludovicianus*). <Bulletin Nuttall Ornithological Club, vol. ii., 1877, p. 50.

Record of a pair of this species rearing three broods (of 5 each) in one season.

1877. [EDITOR] [Notice of] Langdon's Catalogue of Birds of the Vicinity of Cincinnati. <American Naturalist, vol. xi., 1877, pp. 616-617.

1877. LANGDON, F. W. A Catalogue of the Birds of the Vicinity of Cincinnati [Ohio], with notes. By Frank W. Langdon. Salem, Mass: The Naturalists' Agency. 1877. 8vo, pamph. pp. 18.

A local list of 279 species, annotated, 236 species identified, and 43 species (with numbers in parenthesis) included on the strength of their known range. The first list of the birds of this locality, and consequently very incomplete.

1877. LANGDON, F. W. Occurrence of the Black Vulture or Carrion Crow in Ohio. <Bull. Nutt. Orn. Club, vol. ii., 1877, p. 109.

Capture of this species at Madisonville, Dec. 1876.

1877. MERRIAM, C. H. A Review of the Birds of Connecticut, with Remarks on their Habits. <Trans. Conn. Acad., vol. iv., July-Oct., 1876, pp. 1-165. Also separate, pamphlet, and bound. A Review of the Birds of Connecticut. By C. Hart Merriam. New Haven: Tuttle, Morehouse & Taylor, printers. 1877. Large 8vo, pp. 1-166.

"An important article, very critical, complete and workmanlike, bringing the subject up to date. * * * I hold it for a model of this sort of work."—*Coues*. Names as Ohioan, *Contopus borealis*, *Harelda glacialis*, and *Edemia americana*.

1877. WHEATON, J. M. The Ruff and the Purple Gallinule in Ohio. <Bull. Nutt. Orn. Club, vol. ii., 1877, p. 50.

First authentic record of *Philomachus pugnax* and *Porphyrio martinica* in Ohio.

1878. J. A. A. [LLEN]. [Review of] Birds of the Vicinity of Cincinnati. <Bulletin Nuttall Orn. Club, vol. iii., No. 1, January, 1878, p. 34.

A review of Langdon's Catalogue of 1877.

1878. BALLOU, W. H. The Natural History of the Islands of Lake Erie. <Field and Forest, vol., iii., 1878, pp. 135-137.

Thirty-eight species given by their common names, 30 breeding.

1878. COUES, ELLIOTT. Department of the Interior. United States Geological Survey of the Territories. F. V. Hayden, U. S. Geologist-in-charge. Miscellaneous publications.—No. 11. Birds of the Colorado Valley, a repository of scientific and popular information concerning North American Ornithology. By Elliott Coues. Part First. Passeres to Laniidæ. Bibliographical appendix. Seventy illustrations. Washington: Government Printing Office. 1878.

Mentions *Sitta pusilla*, *Dendroica kirtlandi*, *Ampelis garrulus* and *Lanius ludovicianus* as Ohioan.

1878. LANGDON, F. W. Observations on Cincinnati Birds. By Frank W. Langdon. <The Journal of the Cincinnati Society of Natural History, vol. i., pp. 110-118.

Contains one additional species, the European *Alauda arvensis*, to the Catalogue of 1877, by same author, and verification of the occurrence of several previously unidentified species, with notes.

1878. MERRIAM, C. H. Remarks on some of the Birds of Lewis County, Northern New York. <Bull. Nutt. Orn. Club, vol. iii., 1878, p. 52.

Collurio ludovicianus var. *excubitoroides* breeding in Ohio.

1878. RIDGWAY, R. Eastward range of *Chondestes grammacus*. <Bull. Nutt. Orn. Club, vol. iii., 1878, p. 43.

Notes its occurrence in Ohio in 1860 (1861).

- 1878-9. BREWSTER, W. Descriptions of the First Plumage in various species of North American Birds. <Bull. Nutt. Club, vol. iii.-iv., 1878, 1879.

"Describes from Ohio specimens, vol. iii., p. 121, *Chondestes grammacus*, first plumage; p. 122, *Euspiza americana*, first plumage; p. 177, *Empidonax acadicus*, first plumage; vol. iv., p. 41, *Euspiza americana*, autumnal plumage, young. The same (1859) reprinted and repaged, pp. 1-39.

1879. BREWER, T. M. The Eggs of the Redstart. <Bull. Nutt. Orn. Club, vol. iv., 1879, p. 118.

Measurement of eggs of *Setophaga ruticilla* from Ohio.

1879. E. C. [OUES]. Review of, Langdon's Revised List of Cincinnati Birds. <Bull. Nutt. Ornith. Club, vol. iv., No. 2, April 1879, pp. 112-113.

1879. E. C. [OUES]. [Review of part 1 of] Jones & Shulze's illustrations of the Nests and Eggs of the Birds of Ohio. <Bull. Nutt. Ornith. Club, vol. iv., No. 1, Jan. 1879, p. 52.

1879. COUES, E. History of the Evening Grosbeak. <Bull. Nutt. Orn. Club, vol. iv., 1879, pp. 65-75.

Mentions the occurrence of the Evening Grosbeak at Cleveland and Columbus, the latter an error, on authority of Dr. J. M. Wheaton.

1879. DURY, CHARLES, and FREEMAN, L. R. Observations on Birds. <Jour. Cin. Soc. Nat. Hist., vol. ii., 1879, pp. 100-104.
Also separate, pamph., repaged, pp. 1-5.

A list of 69 species, with dates of observation, with notes of peculiarities in nesting, etc. First authentic record of *Tringa bairdii* and *Sterna hirundo* in the vicinity of Cincinnati, and first authentic record of *Thryothorus bewickii* in Ohio, 2 specimens, March 27, 1879.

- 1879-81. JONES, G. E., and SHULZE, E. J. Illustrations of the nests and eggs of the birds of Ohio, with text. By Genevieve E. Jones and Eliza J. Shulze. Circleville, Ohio. 1879. Folio, in about 23 parts, three plates in each part, colored by hand; also issued uncolored. Text by Dr. Howard Jones.

A magnificent work. The illustrations are simply superb, and the text very thorough. But a limited number of copies (40 or 50) issued.

The untimely death (August 17, 1879) of one of its talented authors, Miss Jones, is to be deeply regretted as a most serious loss to ornithological science and art. Miss Jones' portion of the work has been continued by her mother, Mrs. Virginia E. Jones, and the work is now (1882) completed.

1879. LANGDON, F. W. Albinism in the Tufted Titmouse. <Bull. Nutt. Orn. Club, vol. iv., 1879, p. 116.

Describes partially albino specimens of *Lophophanes bicolor*.

1879. LANGDON, F. W. The White-rumped and Loggerhead Shrikes in Ohio. <Bull. Nutt. Orn. Club, vol. iv., 1879, p. 120.

Record of capture of *Collurio ludovicianus*, and of var. *excubitoroides*, at Madisonville, Ohio.

1879. LANGDON, F. W. A Revised List of Cincinnati Birds. By Frank W. Langdon. <Jour. Cin. Soc. Nat. Hist., vol. i., No. 4, Jan. 1879, pp. 167-193. Also reprint, repaged, 8vo pamph, pp. 27.

A Complete revision of the author's 1877 Catalogue, giving 256 identified species and 26 probabilities. Dates and periods of occurrence for most species are given, 83 breeders are marked by asterisk, and peculiar ornithological features of the locality are referred to.

1879. LANGDON, F. W. Nesting of the Kentucky Warbler in Ohio. <Bull. Nutt. Orn. Club, vol. iv., 1879, p. 236.

Record of nesting with description of nest and eggs; the second instance known for the State.

1879. MARSHALL, D. M. The Butcher Bird. <The Journal of Science (newspaper, Toledo, O.), new series, vol. ii., 1879, No. 6.

The northern shrike breeding near Toledo. (Error) see Wheaton's appendix to Bibliography of Ohio Ornithology.

1879. PURDIE, H. A. Another Kirtland's Warbler. <Bull. Nutt. Orn. Club, vol. iv., 1879, p. 185.

Enumerates nine examples of *Dendroica kirtlandi* known, four of which are Ohioan.

1879. WHEATON, J. M. Kirtland's Warbler again in Ohio. <Bull. Nutt. Orn. Club, vol. iv., 1879, p. 58.

Male and female *D. kirtlandi*, taken at Rockport, by William and John Hall, in 1878.

1879. WHEATON, J. M. Occurrence of Birds rare to the vicinity of Columbus, Ohio. <Bull. Nutt. Orn. Club, vol. iv., 1879, p. 62.

Loxia curvirostra (in June), *Elanoides forficatus*, *Strix flammea* var. *americana*, *Cupidonia cupido*.

1880. J. A. A. [LLEN]. [Review of] Brayton's Catalogue of the Birds of Indiana. <Bulletin and Nuttall Ornith. Club, vol. v., No. 3, July, 1881, pp. 174-175.

1880. J. A. A. [LLEN]. [Review of] Langdon's Ornithological Field Notes. <Bulletin Nuttall Ornith. Club, vol. v., No. 4, Oct. 1880, pp. 232-233.

1880. BRAYTON, A. W. A catalogue of the Birds of Indiana, with Keys and descriptions of the groups of greatest interest to the horticulturist, by Alembert W. Brayton, B. S., M. D.

◁Transactions of the Indiana State Horticultural Society for 1879, pp. 87-165.

A good list of 306 species. Mainly a compilation, as the author freely acknowledges, being a combination of Nelson's "Birds of North-eastern Illinois" and Langdon's "Revised List of Cincinnati Birds"; it contains, however, much additional matter of interest, and descriptions of many species and higher groups.

1880. CHUBB, H. E. Spring Field Notes. ◁Forest and Stream (newspaper), vol. xiv., No. 12, May 20, 1880, p. 307.

Notes on the arrival and captures, at Cleveland, from Feb. 12 to May 4, 1880, 87 species. Among them, yellow-throated gray warbler, Florida gallinule, April 19; large-billed water thrush, long-billed curlew and little yellow rail, April 24; red-throated diver and horned grebe, April 30; Kirtland's warbler, May 4.

1880. E. C. [OUES]. [Review of Part 2 of the] Misses Jones and Shulze's Nests and Eggs of the Birds of Ohio. ◁Bulletin of the Nuttall Ornith. Club, vol. v., No. 1, Jan. 1880, pp. 39-40.

1880. INGERSOLL, SEYM. Unusual Nesting Places. ◁Forest and Stream, vol. xiv., No. 12, April 22, 1880, p. 224.

Robin nesting on railway bridge; chipping sparrow nesting in a hanging basket of plants.

1880. INGERSOLL, SEYM. [Spring arrivals]. ◁Forest and Stream, vol. xiv., No. 12, April 22, 1880, p. 22.

About twenty species noted from Feb. 10 to April 3.

1880. LANGDON, F. W. Description of a New Warbler of the Genus *Helminthophaga*, by Frank W. Langdon. ◁Bulletin Nuttall Orn. Club, vol. v., No. 4, Oct. 1880, pp. 208-210, with colored plate.

Reprinted from *Journal Cin. Soc. Nat. Hist.*, July, 1880, *q. v.*

1880. LANGDON, F. W. Description of a New Warbler of the Genus *Helminthophaga*. By Frank W. Langdon. ◁*Jour. Cin. Soc. Nat. Hist.*, vol. iii., 1880, pp. 119, 120, with colored plate.

The original description of *Helminthophaga cincinnatiensis*.

1880. LANGDON, F. W. Ornithological Field Notes, with five additions to the Cincinnati Avian Fauna. By Frank W. Langdon. ◁*Jour. Cin. Soc. Nat. Hist.*, vol. iii., 1880, pp. 121-127.

Adds *Cistothorus stellaris*, *Helminthophaga celata*, *Melospiza lincolni*, *Tringa fuscicollis*, and a new species, *Helminthophaga cincinnatiensis*; also notes, capture of two additional specimens of Kirtland's warbler near Cleveland, Ohio, May 4 and 12, 1880.

1880. LANGDON, F. W. Summer Birds of a Northern Ohio Marsh. By Frank W. Langdon. <Jour. Cin. Soc. Nat. Hist., vol. iii., 1880, pp. 220-232.

A list of 95 species, for the most part briefly annotated or not, of birds observed "on the grounds of the Wynous' Point Shooting Club, near Port Clinton, Ottawa county, Ohio, during the week ending July 4, 1880." Full notes of the nesting of *Ardetta exilis*, *Gallinula galeata*, *Hydrochelidon lariformis*, *Podiceps cornutus* (?) and *Podilymbus podiceps*.

1880. RIDGWAY, ROBERT. Note on *Helminthophaga cincinnatiensis*, Langdon. <Bulletin Nuttall Ornith. Club, vol. v., No. 4, Oct., 1880, pp. 237-238.

A critical note, questioning its validity as a species, and suggesting the possibility or probability of its being a hybrid between *Helminthophaga pinus* and *Oporornis formosus*. A further study of the specimen in question has caused Mr. Ridgway to modify considerably his opinion above cited, and he ranks it as a species in his *Nomenclature of North American Birds*, of 1881, but still suggests that it "may be" a hybrid. As Dr. Coues himself asked the privilege of describing it as a species, and of naming it after its discoverer, its validity may be considered as at least probable.

1881. BECKHAM, C. W. *Peucea æstivalis illinoisensis*, Ridgway. <Journal Cin. Soc. Nat. Hist., vol. iv., pp. 339-340.

Capture of the species at Bardstown, Ky., about 100 miles southwest of Cincinnati.

1881. BREWSTER, WILLIAM. On the Relationship of *Helminthophaga leucobronchialis*, Brewster, and *Helminthophaga lawrencei*, Herrick; with some conjectures respecting certain other North American Birds. <Bulletin Nuttall Orn. Club, vol. vi., No. 4, Oct., 1881, pp. 218-225.

Advances the hypothesis that the above-named species are hybrids between *H. pinus* and *H. chrysoptera*, and sustains it by quoting in a footnote to page 224, Mr. Ridgway's supposition in regard to the hybridity of *Helminthophaga cincinnatiensis*.

1881. EDITOR [F. W. LANGDON]. Zoological Miscellany. <Journal Cin. Soc. Nat. Hist., vol. iv., pp. 336-346.

Notes relating to local ornithology. 43 species are treated of, and *Harelda glacialis* is added to the local fauna on the authority of Miss Emma Goepper. *Coturniculus passerinus*, breeding near Cincinnati; nest and eggs taken by Mr. Charles Dury.

1881. EDITOR [F. W. LANGDON]. Introduction of European Birds. <Journal Cin. Soc. Nat. Hist., vol. iv., pp. 342-343.

List of 20 species European birds, introduced by Acclimation Society of Cincinnati, in 1872, '73, and '74, with general remarks on effect of same on native birds, etc.

1881. JONES, HOWARD E. *Aluco flammeus americanus*, Ridgway.
 <Journal Cin. Soc. Nat. Hist., vol. iv., p. 340.
 Capture of a specimen near Circleville, O.
1881. PORTER, J. B. *Archibuteo lagopus sancti-johannes*, Ridgway.
 <Journal Cin. Soc. Nat. Hist., vol. iv., p. 340.
 Specimen taken at Glendale, O.
1881. QUICK, E. R. *Catharista atrata*, Less. <Journal Cin. Soc.
 Nat. Hist., vol. iv., pp. 340-341.
 Two specimens observed near Brookville, Ind.
1881. QUICK, E. R. *Chen hyperboreus*, Boie. <Journal Cin. Soc.
 Nat. Hist., vol. iv., p. 341.
 Specimen taken near Brookville, Ind.
1882. ABERT, JAMES W. [Notes on Western Birds.] <Journal Cin.
 Soc. Nat. Hist., vol. v., pp. 57-59.
 List of about 50 species observed during a march from Fort Leavenworth, Mo., to Santa Fe, New Mexico, and back, in the winter of 1846-7. Mentions parakeet in flocks at Council Grove, Kansas, in February and March, 1847; with snow on ground, and river blocked with ice.
1882. BECKHAM, C. W. Spring Arrivals at Bardstown, Ky. <Journal
 Cin. Soc. Nat. Hist., vol. v., p. 93.
 Notes unusually early arrival of 12 species of birds.
1882. W. B. [REWSTER]. [Review of] Langdon's Zoological Miscellany,
 No. 1. <Bulletin Nuttall Oraith. Club, vol. vii., No. 1, Jan.
 1882, pp. 50-51.
1882. BUTLER, A. W. Ornithological Notes from Brookville, Ind.
 <Journal Cin. Soc. Nat. Hist., vol. v., pp. 192-193.
 Notes on 12 species of birds. Mocking bird a rare summer resident;
Gathlypis philadelphia and *Dendraca pinus* taken, etc.
1882. BUTLER, A. W. [The] Birds [of Franklin Co., Ind.] <Atlas
 of Franklin Co., Ind., etc., J. H. Beers & Co., Chicago, 1882
 (for title in full see Mammalia, 1882, p. 11).
 Classified and annotated list of 224 species and varieties; nomenclature
 brought down to date. List begins on p. 11, and ends on p. 12. Based on
 personal observations of the author, assisted by Dr. Rufus Haymond and
 Mr. E. R. Quick. (Not seen; this notice from memoranda furnished by
 Mr. Butler.)

1882. E. C. [OUES]. [Review of Jones & Shulze's] Illustrations of Ohio Nests and Eggs. <Bulletin Nuttall Orn. Club, vol. vii., No. 1, Jan., 1882, pp. 45-46.
1882. E. C. [OUES]. [Review of Jones & Shulze's] Nests and Eggs of Ohio Birds. <Bulletin Nuttall Orn. Club, vol. vii., No. 2, April, 1882, pp. 112-113.
1882. DAVIE, OLIVER. Capture of the Golden Eagle (*Aquila chrysaëtus canadensis*) near Columbus, Ohio. <Bulletin Nuttall Ornith. Club, vol. vii., No. 2, April 1882, p. 123.
Records capture of a specimen five miles west of Columbus.
1882. DOUGLASS, WALTER. *Hylotomus pileatus*, *Querquedula discors* *Chaulelasmus streperus* [and] *Fulix affinis*. <Journal Cin. Soc. Nat. Hist., vol. v., pp. 191-192.
Local occurrences.
1882. EDITOR [F. W. LANGDON]. Dichromatism in the Screech Owl (*Scops asio*, Bp.)* <Journal Cin. Soc. Nat. Hist., vol. v., p. 52.
Table showing coloration of 56 specimens from Ohio, Indiana, and Kentucky.
1882. EDITOR [F. W. LANGDON]. *Mimus polyglottus*, Boie. <Journal Cin. Soc. Nat. Hist., vol. v., p. 56.
Capture of a specimen about 100 miles southwest of Cincinnati, in January, by Mr. C. W. Beckham.
1882. EDITOR [F. W. LANGDON]. *Spiza americana* (anomalous plumage). *Cupidonia cupido* (in confinement). *Rallus elegans* (food of). <Journal Cin. Soc. Nat. Hist., vol. v., pp. 95-96.
1882. PORTER, J. B. *Myiodioctes mitratus*, *Pandion haliaetus*, *Totanus flavipes*, *Bartramia longicauda*, *Rhyacophilus solitarius*. <Journal Cin. Soc. Nat. Hist., vol. v., p. 191.
Local notes.
1882. QUICK, E. R. Winter Birds of 1880 and 1881 on the White-water. <Journal Cin. Soc. Nat. Hist., vol. v., pp. 54-56.
41 species mentioned; also notes on habits of 5 additional species on page 54.
1882. QUICK, E. R. Brookville [Indiana] Notes [on Birds]. <Journal Cin. Soc. Nat. Hist., vol. v., pp. 93-95.
Records *Thryomanes bewicki* and *Helminthotherus vermivorus* as breeding; wild turkey taken in Franklin Co., Ind., in December, 1878; notes on other species.

1882. QUICK, E. R. Ornithological Notes from Brookville, Ind.
 <Journal Cin. Soc. Nat. Hist., vol. v., p. 192.

Late occurrence of barn and rough-winged swallows, etc.

1882. SHORTEN, J. W. Albinism [in] *Buteo borealis*. <Journal Cin. Soc. Nat. Hist., vol. v., p. 53.

Specimen from Clinton county, O.

1882. SHORTEN, J. W. *Aluco flammeus americanus*, Ridgway. <Journal Cin. Soc. Nat. Hist., vol. v., p. 57.

Specimen taken near Cincinnati, 1882.

1882. SHORTEN, J. W. *Herodias alba egretta*, Ridgway. <Journal Cin. Soc. Nat. Hist., vol. v., p. 95.

Notes on capture of American egret, at Maysville, Ky., in breeding plumage.

1882. SHORTEN, J. W. [Relation of Rapacious Birds to Agriculture.]
 <Jour. Cin. Soc. Nat. Hist., vol. v., pp. 67-70.

Refers to food of various species, and quotes letters on the subject from Prof. Baird and Dr. Coues.

1882. SHORTEN, J. W. *Buteo borealis*, Vieillot. <Journal Cin. Soc. Nat. Hist., vol. v., p. 95.

Note on its food.

1882. WHEATON, J. M. Report on the Birds of Ohio, by J. M. Wheaton, M.D. <Report of the Geological Survey of Ohio. Volume IV., Zoology and Botany. Part I, Zoology. Officers of the Survey: J. S. Newberry, Chief Geologist; Edward Orton, Assistant Geologist; E. B. Andrews, Assistant Geologist; T. G. Wormley, Chemist; F. B. Meek, Palæontologist. Special Assistants in Zoology and Botany: J. M. Wheaton, D. S. Jordan, A. W. Brayton, W. H. Smith, H. C. Beardslee, R. M. Byrnes. Published by authority of the legislature of Ohio. Columbus: Nevins & Myers, State Printers, 1882.—Section II. Report on the Birds of Ohio, J. M. Wheaton, M.D., pp. 187-628. (Duplicate title on p. 189 has "by" inserted before author's name.)

An exhaustive treatise, prefaced by dissertations on the Physical Geography, climate and faunal peculiarities of the State, laws of geographical variation, etc. The report proper embraces: (1), a treatise on birds as a class, with a synopsis of the various orders; (2), brief descriptions of the

species and higher groups; (3), a useful synonymy of each species; (4), an account of the distribution, habits and general life history of each species, especially as regards the State of Ohio. 298 species are treated of in all, and in an exceedingly thorough and comprehensive manner.

In the "Appendix" are given [A] Check List of Ohio Birds, with dates of their occurrence; [B] List of Birds observed in my (Dr. Wheaton's) garden; [C] Additions, additional references and corrections; [D] Bibliography of Ohio Ornithology; [E] On the Relation between Latitude and the Pattern of Coloration in Ohio Birds; [F] Glossary of Technical Terms used in the preceding descriptions.

Altogether, this is by far the most admirable work on the birds of any one State with which we are acquainted, and is all the more creditable to its author for being the result of "a labor of love" performed amid the cares and exacting demands of a busy professional life.

CLASS REPTILIA.

1838. KIRTLAND, J. P. Report on the Zoology of Ohio, by Prof. J. P. Kirtland, M.D. <Second Annual Report on the Geological Survey of the State of Ohio, by W. W. Mather, etc. (see Mammalia, p. 7, for title in full.)

The list of reptiles comprises 27 species, 25 of which are annotated.

1876. JORDAN, D. S. Manual of the Vertebrates of the Northern United States (*vide* Mammalia, p. 9, for title in full).

1881. EDITOR [F. W. LANGDON]. (*Cistudo clausa* and *Aspidonectes spinifer*.) <Jour. Cin. Soc. Nat. Hist., vol. iv., p. 343.

Note on occurrence of remains of these species in a prehistoric cemetery.

1882. SMITH, W. H. Report on the Reptiles and Amphibians of Ohio, by W. H. Smith, M.D., Ph. D. <Report of the Geological Survey of Ohio. Vol. IV., Zoology and Botany. Part 1, Zoology (*vide* p. 30, for title in full). Section iii., pp. 629-734.

The report contains: (1), Letter of transmittal; (2), Introduction, containing a good general account of reptiles and amphibians, their use and abuse, etc.; (3), A synopsis of the higher groups; (4), Synonymy, descriptions and life histories of the various species; (5), A tabular list, embracing 42 species and varieties of reptilia, of which six are considered doubtfully Ohioian; and 25 species and varieties of amphibia, three of which are said to be of doubtful occurrence in the State.

1882. SMITH, W. H. *Vide* REPTILIA *supra*.

The most complete work on Ohio reptilia extant, and our herpetologists may well congratulate themselves and the author on the appearance of so important a contribution to the history of this much neglected class of animals.

CLASS AMPHIBIA.

1838. KIRTLAND, J. P. Report on Zoology of Ohio (*vide* Mammalia, p. 7, for title in full).

A list of 20 species, with notes on 3.

1876. JORDAN, D. S. Manual of the Vertebrates of the Northern United States (*vide* Mammalia, p. 9, for title in full).

1881. EDITOR [F. W. LANGDON]. *Rana temporaria sylvatica*, Gunther (the Wood Frog). <Journal Cin. Soc. Nat. Hist., vol. iv., pp. 343-344.

Describes both sexes, and notes breeding habits.

1882. QUICK, E. R. *Diemyctylus viridescens*, Raf., and *Spelerpes longicaudus*, Bd. <Journal Cin. Soc. Nat. Hist., vol. v., p. 96.

Occurrence at Brookville, Ind.

CLASS PISCES.

1818. RAFINESQUE, C. S. Discoveries in Natural History, made during a Journey through the Western Region of the United States, by Constantine Samuel Rafinesque, Esq. <American Monthly Magazine and Critical Review, Sept. 1818.

Not seen; quoted from Jordan's Report on the Fishes of Ohio, 1882. Catalogue of 26 species, with 9 descriptions of Ohio river fishes.

1818. RAFINESQUE, C. S. Further Discoveries in Natural History, made during a Journey through the Western Region of the United States, by Constantine Samuel Rafinesque, Esq. <*Op. cit.*, Oct. 1818.

Catalogue of 22 additional species, with three descriptions of Ohio river fishes. Not seen; quoted from Jordan's Report on the Fishes of Ohio, 1882.

1818. RAFINESQUE, C. S. Further Account of Discoveries in Natural History in the Western States, by Constantine Samuel Rafinesque, Esq. <*Op. cit.*, Nov. 1818.

Describes three new species and genera, viz.: *Pomoxis annularis*, *Noturus flavus*, *Sarchirus vittatus*. Not seen; taken from Jordan's Report on the Fishes of Ohio, 1882.

1819. RAFINESQUE, C. S. Prodrôme de 70 nouveaux, Genres d'Animaux découverts dans l'intérieur des Etats Unis d'Amerique durant l'année 1818. <Journal de Physique de Chymie et d'Histoire Naturelle, Paris, June, 1819.

17 species added to former list. Not seen; taken from Jordan's Report, 1882.

1820. RAFINESQUE, C. S. Description of the Silures or Cat-fishes of the River Ohio, by C. S. Rafinesque, Professor of Botany in the Transylvania University of Lexington, Kentucky. <Quarterly Journal of Science, Literature and Arts, Royal Institution, London, vol. ix., 1820.

17 species and varieties described. Not seen; this notice abridged from Jordan's Report on the Fishes of Ohio, 1882.

1820. RAFINESQUE, C. S. Ichthyologia ohioensis, or Natural History of the Fishes inhabiting the River Ohio and its Tributary Streams, etc. etc. (for full title and comments see Jordan's Report on Fishes of Ohio, 1882).

This is a series of oversheets repaged and bound, the originals of which appeared in the "Western Review and Miscellaneous Magazine," published at Lexington, Ky., in 1819-20.

1838. KIRTLAND, J. P. Report on the Zoology of Ohio (*vide* Mammalia, p. 7, for title in full).

List of 72 species, with notes on 51.

- 1840-46. KIRTLAND, J. P. Descriptions of the Fishes of Lake Erie, the Ohio river and their Tributaries. <Boston Journal of Natural History, vols. iii., iv. and v., 1840-1846.

Described 66 species, belonging to 32 genera, with figures of each species by the author. Not seen; this notice from Jordan's Report on the Fishes of Ohio, 1882.

1874. [KLIPPART, J. H.—HUSSEY, JOHN.—STERLING, E. T.]—Report of the Commissioners of Fisheries of the State of Ohio, for the year ending December, 1873. Columbus: Nevins & Myers, State Printers, 1874. 8vo pamph., pp. 40.

Contains information of a practical character in regard to fishes and waters of the State, with suggestions, etc. Several species are illustrated by wood-cuts.

1876. JORDAN, D. S. Manual of the Vertebrates of the Northern United States (*vide* Mammalia, p. 9, for title in full).
1877. [FISHER, J. C.—CUMMINGS, R.—KLIPPART, J. H.]—First Annual Report of the Ohio State Fish Commission to the Governor of the State of Ohio, for the years 1875 and 1876. Columbus : Nevins & Myers, State Printers, 1877. 8vo pamph., pp. 96. Illustrated by 21 wood-cuts on 13 plates.
- Various species of bass, perch, pike, and whitefish, described and figured, with remarks on their habits and availability for food, etc. There is also a classified list of Ohio fishes, by Prof. D. S. Jordan. The figures are well drawn by Miss Josephine Klippart.
1878. [FISHER, J. C.—KLIPPART, J. H.—CUMMINGS, R.]—Second Annual Report of the Ohio State Fish Commission to the Governor of the State of Ohio, for the year 1877. Columbus : Nevins & Myers, State Printers, 1878. 8vo pamph., p. 116.
- On economic ichthyology principally, with 17 species (chiefly pike, catfish and suckers), described and figured. The technical matter, from MSS. by Prof. D. S. Jordan, arranged by Mr. E. R. Copeland. Remainder chiefly by Mr. John H. Klippart.
- There is also (pp. 59-64), a letter by Col. Wm. O. Collins, of Hillsboro, O., on the Highland county waters.
1879. [FISHER, J. C.—HARRIS, L. A.—CUMMINGS, R.]—Third Annual Report of the Ohio State Commission, made to the Governor of the State of Ohio, for the year 1878. Columbus : Nevins & Myers, State Printers, 1880. 8vo pamph., pp. 22.
- The principal feature is the report on artificial fish culture of the Superintendent of Hatcheries, Mr. Emery D. Potter, of Toledo, O.
1880. [FISHER, J. C.—CUMMINGS, R.—HARRIS, L. A.]—Fourth Annual Report of the Ohio State Fish Commission, made to the Governor of the State of Ohio, for the year 1879. Columbus : Nevins & Myers, State Printers, 1880. 8vo pamph., pp. 35.
- Essays on Pisciculture, by E. D. Potter, and the Commissioners.
1881. EDITOR [F. W. LANGDON]. *Perca flavescens*, Cuvier, Common Yellow Perch. <Journal Cin. Soc. Nat. Hist., vol. iv., p. 345.
1881. [FISHER, J. C.—CUMMINGS, R.—HARRIS, L. A.]—Fifth Annual Report of the Ohio Fish Commission, made to the Governor of the State of Ohio, for the year 1880. Columbus, Ohio : C. J. Brand & Co., State Printers, 1881. 8vo pamph., pp. 34.
- Special Report on Pisciculture, by E. D. Potter, with general remarks, tables of expenses, etc.

1882. [HARRIS, L. A.—BOND, C. W.—POST, H. C.]—Sixth Annual Report of the Ohio Fish Commission, made to the Governor of the State of Ohio, for the year 1881. Columbus: C. J. Brand & Co., State Printers, 1882. 8vo pamph., pp. 19.

Chiefly on carp culture, and reports of progress of the commission.

1882. JORDAN, D. S. Report on the Fishes of Ohio, by David S. (*sic*) Jordan, M.D. <Report of the Geological Survey of Ohio, vol. iv., etc., 1882 (*vide* p. 10, for title in full).

Prof. Jordan's Report on the Fishes of Ohio, occupies section xv., pp. 735-1000 of the volume, beginning with a chapter on Bibliography, from which we extract liberally for the present paper. Following this is a comparison, as regards nomenclature, of "four lists of Ohio fishes," namely: those of Rafinesque, 1820; Kirtland, 1840-46; and Jordan, 1879; the fourth being merely the names applied to the same species by Dr. Gunther in his Catalogue of the Fishes of the British Museum.

This comparative table, as Prof. Jordan remarks, is "interesting as showing the progress of our knowledge of Ohio fishes, and the changes which have taken place in nomenclature. The introduction also contains tables: (1), Of species characteristic of the Ohio river fauna; (2), Of species of general distribution, occurring probably in every suitable stream in the State; (3), Of species taken in White river, near Indianapolis, Ind. The report proper embraces full descriptions of the species and higher groups, with synonymy, life-histories in most cases, etc. 165 species (in 88 genera) are treated of, and the work is undoubtedly the most complete exposition of Ohio Ichthyology extant.

1882. QUICK, E. R. *Haplodonotus grunniens*, Grunting Perch or Sheepshead. <Journal Cin. Soc. Nat. Hist., vol. v., p. 60.

Note on its occurrence in the Whitewater.

SUBKINGDOM ARTICULATA.

CLASS INSECTA.

NOTE.—The following bibliography of Cincinnati Entomology has been mainly prepared by Mr. Charles Dury, the well-known entomologist. It aims to include all publications relating to the insects of this vicinity with the exception of the Tineina and other micro-lepidoptera. A bibliography of the latter has been promised by Mr. V. T. Chambers, one of the highest authorities on the subject, but has failed to reach us in time for this number of the JOURNAL. We hope to be able to present it to our readers at an early date.

1864. WARDER, JNO. A., M.D. *Thyridopteryx ephemeriformis*, *Orgyia leucostigma*, *Datana ministra*, *Clostera inclusa*, *Cantharidæ* and *Lyttæ*, *Clytus pictus*, *Tingis ciliata*, *Tettigania vitis*.

Gryllidæ, Locustidæ, Ambulatoria, Hemiptera, Orthoptera, Bark-lice, Peach tree *Ægeria*, Habits of Insects, Apple tree Borers, Cut-worms, Classification of Insects, Pea-bugs, Leaf-rollers, Fall Web-worms, Saw-flies, Corn-worms, Grape infesting Caterpillars, etc.

These papers were of a practical rather than a technically scientific character. They were published in the *Daily Times* and *Farmer's Home* for 1864, and the Report of the Ohio State Board of Agriculture for 1865. They were intended for horticulturists especially.

1874. WETHERBY, A. G. Method of rearing Lepidopterous Larvæ. <Cin. Quarterly Journal of Science, vol. i., p. 154.

1875. WETHERBY, A. G. Descriptions of Lepidopterous Larvæ, with Remarks on their Habits and Affinities. Read before the Cincinnati Society of Natural History, at the regular meeting, Oct. 5, 1875. <Cin. Quarterly Journal of Science, vol. ii., pp. 363-371.

Descriptions of larvæ of eight species *Limacodes*, and allies.

1876. ANGUS, JAS. Account of Capture of *Catocala marmorata*, near Cincinnati. <Canadian Entomologist, vol. viii., p. 199.

1876. DURY, CHARLES. List of *Catocala* observed in the vicinity of Cincinnati, Ohio. <Canadian Entomologist, vol. viii., p. 187.

1876. [?] STRECKER, HERMAN. Note on *Sphinx plota*. <Lepidoptera, No. 13, p. 115.

1877. DURY, CHARLES. Note on *Catocala marmorata* and *Agrippina*. <Canadian Entomologist, vol. ix., p. 178.

1877. SIEWERS, C. G. Notes on Larvæ—Fondness for Water—Hints to Beginners. <Canadian Entomologist, vol. ix., p. 127.

One paper with three titles; a very useful contribution to practical entomology.

1878. DURY, CHARLES. Catalogue of the Lepidoptera observed in the vicinity of Cincinnati, Ohio, etc. <Journal Cin. Soc. Nat. Hist., vol. i., p. 12.

1878. DURY, CHARLES. Notes on Several Species of Coleoptera, with some account of Habits. <Canadian Entomologist, vol. x., p. 210.

1878. SIEWERS, C. G. Notes on Larvæ, etc. <Canadian Entomologist, vol. x., p. 84.
1878. SIEWERS, C. G. Wintering Vanessa antiopa. <Canadian Entomologist, vol. x., p. 115.
1877. GROTE, A. R. Description of a new Botis, allied to Flavidalis, by A. R. Grote, Director of the Museum, Buffalo Society Natural Sciences. <Canadian Entomologist, vol. ix., p. 10.
Description of *Botis langdonalis*, n. sp.
1879. DURY, CHARLES. On the occurrence of Omophron robustum, Dacne ulkei, and Coptodera ærata, near Cincinnati. <Bulletin Brooklyn Entomological Soc., 1879, p. 56.
1879. DURY, CHARLES. List of Coleoptera observed in the vicinity of Cincinnati, with notes. <Journal Cin. Soc. Nat. Hist., vol. ii., p. 162.
1879. SIEWERS, C. G. Tails of Callimorpha interrupta marginata. <Canadian Entomologist, vol. xi., p. 47.
1879. WILSON, HAROLD B. On the Larvæ of Cucujus clavipes. <Bulletin Brooklyn Entomological Society, p. 59.
1881. DURY, CHARLES. Note on Chrysomela juncta, C. 10-lineata, and Caryoborus arthriticus. <Canadian Entomologist, vol. xiii., p. 20.
1881. EDITOR [F. W. LANGDON]. Callosamia promethea, Dury. <Journal Cin. Soc. Nat. Hist., vol. iv., p. 345.
Note on finding cocoons in "Button Bush" and "Tulip Tree."
1881. EDITOR [F. W. LANGDON]. Botys langdonalis, Grote. <Journal Cin. Soc. Nat. Hist., vol. iv., p. 345.
Additional specimens taken by Messrs. C. F. Low and C. Dury.
1882. DURY, CHARLES. Notes on Coleoptera. <Journal Cin. Soc. Nat. Hist., vol. v., p. 61.
1882. DURY, CHARLES. [Synopsis of the Cincinnati Insect Fauna.] <Journal Cin. Soc. Nat. Hist., vol. v., p. 187.
1882. DURY, CHARLES. Coleoptera of the vicinity of Cincinnati. <Journal Cin. Soc. Nat. Hist., vol. v., p. 218.

1882. SIEWERS, C. G. Hymenoptera—A Slave Foray. *Formica ruber* and *Formica niger*. <Journal Cin. Soc. Nat. Hist., vol. v., p. 60.

Account of a raid by an army of red ants on a colony of black ones.

1882. SIEWERS, C. G. Notes on Coleoptera. <Journal Cin. Soc. Nat. Hist., vol. v., p. 96.

The species given as *Necrophilus subterraneus* is *N. petteti*, Horn. [C.D.]

1882. SHORTEN, J. W. Note on *Macrosila cingulata*. <Journal Cin. Soc. Nat. Hist., vol. v., p. 62.

CLASS ARACHNIDA.

1882. WOOD, MRS. DR. THOMAS. [Synopsis of the Arachnida of the vicinity of Cincinnati.] <Journal Cin. Soc. Nat. Hist., vol. v., p. 188.

CLASS CRUSTACEA.

1838. KIRTLAND, J. P. Report on the Zoology of Ohio, by Prof. J. P. Kirtland, M.D. <Second Annual Report on the Geological Survey of Ohio, by W. W. Mather, etc. (*vide* Mammalia, p. 7, for title in full).

Mentions two species *Astacus* (Crayfish) found in Ohio.

1874. CHAMBERS, V. T. On Fresh-water Entomostraca, by V. T. Chambers, Esq., of Covington, Ky. <The Cincinnati Quarterly Journal of Science, vol. i., pp. 22-26.

Remarks on recent and fossil species of this order from this vicinity.

1881. CHAMBERS, V. T. Two New Species of Entomostraca, by V. T. Chambers. <Journal Cin. Soc. Nat. Hist., vol. iv., pp. 47-48.

Description of *Tachidius* (?) *fonticola* and *Diaptomus* (?) *kentuckyensis*, with two plates.

1882. HUNT, J. H. List of Microscopic Articulata, Cœlenterata and Protozoa, observed in an office aquarium, by J. H. Hunt, M.D. <Journal Cin. Soc. Nat. Hist., vol. v., pp. 193-194.

Nine species Crustaceans; one of Arachnids, nine of Annelids, two of Hydrozoa, one of Spongida, twelve of Infusoria, four of Rhizopoda.

CLASS ANNELIDA.

1874. EDITOR [S. A. MILLER]. *Trichina spiralis*. <Cin. Quar. Jour. Sci., vol. i., pp. 160-161.

Notice of trichinized pork, from Aurora, Ind., exhibited before the Cincinnati Society of Natural History, by Dr. Sutton.

1882. HUNT, J. H. *Vide Crustacea, supra*.

SUBKINGDOM MOLLUSCA.

NOTE.—The following bibliography of the Conchology of Ohio has been prepared expressly for this occasion by Mr. A. F. Gray, the well-known conchologist, formerly of Danversport, Mass., and now of this city. Its scope embraces the entire State of Ohio. As the conchology of this vicinity is almost inseparable (bibliographically at least) from that of the remainder of the State; and as no bibliography of Ohio Conchology has ever been published, its extended scope will make it none the less useful to our local conchologists, while it will be all the more so to those of the State at large.—[ED.]

BIBLIOGRAPHY OF THE CONCHOLOGY OF OHIO.

By ARTHUR F. GRAY.

In the following Bibliography it has been the writer's intention to include all papers pertaining to the Fauna of the State, in the department of Recent Mollusca, referring only to the more general works when they contain information of value to the student of the region. Many papers treating more or less fully upon the Lingual Dentition and Genitalia of the Pulmonata, by Binney and Bland, are omitted here as not coming within the scope of this paper, which is intended to be Faunal in its character. It is scarcely to be hoped, that it will be found to be free from errors and omissions, but that it may be found of use to the resident conchologists of the State in their work. It is brought down to date.

CINCINNATI, OHIO, *December 15, 1882.*

- 1792-1832. BRUGUIERE, LAMARCK, DESHAYES. In the *Encyclopédie Méthodique* there are three volumes of text and five of plates devoted to Conchology, *Histoire, Naturelle des Vers*. Tome i., par M. Bruguiere, Paris, 1792. Tome ii., par M. G. P. Deshayes, Paris, 1830. Tome iii., par M. G. P. Deshayes, Paris, 1832.

The plates were issued 1791-1832.—A. F. G.

1816. SAY. "Conchology." <American edition of Nicholson's Encyclopedia of Arts and Sciences, vol. ii., first edition, Philadelphia, 1816.

A second edition was published in vol. iv., in 1818, and a third edition in vol. iv., 1819. These contain original descriptions of several shells from Ohio. The paper was also distributed with a distinct title page separately. "Descriptions of Land and Fresh-water Shells of the United States."—A. F. G.

- 1818-22. LAMARCK. Histoire Naturelle des animaux sans Vertebres, etc., par M. le Chevalier de Lamarck, Paris, 1818-22, vols. v., vi., vii. Second edition of same 1840-44.

1818. RAFINESQUE. Farther account of the Discoveries in Natural History in the Western States: by C. S. Rafinesque. <Am. Month. Mag. and Crit. Rev., vol. iv., p. 39. New York, 1818.

Elliptoma is the genus treated.—A. F. G.

1818. RAFINESQUE. Discoveries in Natural History, made during a Journey through the Western States, by C. S. Rafinesque. <Am. Month. Mag. and Crit. Rev., vol. iii., p. 354. New York, 1818.

The genera mentioned are, *Potamilus*, *Pleurocera* and *Ambloxis*.—A.F.G.

1818. SAY. Description of a new genus of Fresh-water Bivalve Shells, by Thomas Say. <Jour. Acad. Nat. Sci., Phila., vol. i., Dec. 1818.

Alasmodonta marginata, described from Scioto river.—A.F.G.

1821. SAY. Descriptions of Univalve Shells, of the United States, by Thomas Say. <Jour. Acad. Nat. Sci., Phila., vol. ii., Jan. 1821.

Several species described, and the genus *Anculotus* formed.—A.F.G.

- 1820-51. FERUSSAC and DESHAYES. Histoire Naturelle générale et particulière des Mollusques Terrestres et Fluviaux, etc., par D. DeFerussac et G. P. Deshayes, Paris, 1820-51.

1820. RAFINESQUE. Monographie des Coquilles bivalves et fluviales de la rivière Ohio (contenant douze genres et soixante-huit espèces: par M. C. Rafinesque, Prof. de bot. et d'hist. nat. à l' Univ. Transylvane de Lexington. <Extrait de la 15me livraison du 5me tome des Annales Générales des Sciences Physiques. Sept., 1820, Bruxelles.)

1820. RAFINESQUE. Apolosia, the Mollusca. By C. S. Rafinesque. <Annals of Nature, No. 1, 1820, Philadelphia.

Description of Limaces chiefly; new genera enumerated are, *Philomycus*, *Eumelus*, and *Hemiloma* (a univalve land shell).—A.F.G.

1823. BARNES. On the Genera Unio and Alasmodonta; with Introductory Remarks by D. W. Barnes. <Am. Jour. Sci. & Arts, O. S., vol. vi., No. 1, pp. 107-127; No. 2, pp. 258-280. (Date of title, 1823.)

In this paper are given descriptions and synonymy of 28 Unios and 5 Alasmodontas, with copper-plate illustrations of 22 species.—A.F.G.

1827. GREEN. Description of *Helix Pennsylvanicus*, by Jacob Green. <Cont. of the Maclurian Lyc. to the Arts and Sciences, vol. i., No. 1, p. 8, Philadelphia, Jan., 1827.

1827. GREEN. Some remarks on the Unios of the United States, with a description of a new species, by Jacob Green. <Cont. of the Maclurian Lyc. to the Arts and Sciences, vol. i., No. 2, p. 41, Philadelphia, July, 1827.

This contains a description of *Unio œsopus*, Green, with a colored plate; also remarks on specific characters, variations, erosion, habits, etc., of various species, with notes on synonymy.—A.F.G.

1828. BARNES. Reclamation of Unios, by D. H. Barnes. <Am. Jour. Sci. and Arts, O. S., vol. xiii., No. 2, pp. 358-364, Jan. 1828.

A criticism of Valenciennes' Uniones, in Humboldt and Boupland's Zoological Observations.—A.F.G.

1828. HILDRETH. Observations on, and descriptions of the Shells found in the waters of Muskingum river, Little Muskingum and Duck Creek, in the vicinity of Marietta, Ohio, by S. P. Hildreth. <Am. Jour. Sci. and Arts, O. S., vol. xiv., pp. 276-291, 1828, with two plates.

Unio foliatus, and *U. phaseolus* are here described.—A.F.G.

- 1829-31. SAY. Descriptions of some New Terrestrial and Fluvatile Shells of North America, by Thomas Say. <New Harmony Disseminator of Useful Knowledge, July 29, 1829, to Jan. 29, 1831.

- 1830-74. LEA. Observations on the Genus *Unio*, etc., by Isaac Lea, vols. i-xiii., with 3 vols. of index. <Trans. Am. Phil. Soc. and Jour. Phila. Acad. Nat. Sci. 1830-1874.

These and other papers by the same author, published through the same mediums, contain much valuable information upon American Shells. Also in Proceedings of Phila. Acad. of Nat. Sci., are to be found many papers bearing on Shells of Ohio, but lack of space precludes their separate treatment.—A.F.G.

1830. MENKE. Synopsis Methodica Molluscorum, etc., quæ in Museo Menkeano adservantur; cum synonymia critica et novarum speciarum diagnosis, auctore Carolo Theodoro Menke, M.D. Pymonti, 1830. Editio altera.

14 American species enumerated, 9 of which are from Ohio, all of which are described as new, viz.: *Physa* 1, *Paludina*, 1, and *Melania*, 7.—A.F.G.

- 1830-(34?). SAY. American Conchology, or Descriptions of North American Shells. Illustrated by colored figures from original drawings executed from nature, by Thomas Say. New Harmony, Ind.

Nos. i. to vi. were published 1830 to April 1834. No. vii. was published after Mr. Say's death by Mr. Conrad without date. In the sixth number, "An attempt to exhibit a synonymy of the Western North American species of the genera *Unio* and *Alasmodonta* is made."—A.F.G.

1831. RAFINESQUE. Continuation of a Monograph of the Bivalve Shells of the river Ohio, and other rivers of the Western States: by C. S. Rafinesque (published at Brussels, Sept. 1820). Containing 46 species, from No. 76 to 121. Including an appendix on some Bivalve Shells of the rivers of Hindostan, with a Supplement on the Fossil Bivalve Shells of the Western States, and the *Tulosites* a new genus of Fossils. Philadelphia, Oct., 1831.

In this paper the author makes a summary of the labors of earlier conchologists who had described American shells prior to 1820, and of the writers who had given attention to the American shells subsequent to the appearance of his first paper.

He inaugurates the following genera and subgenera: Of *Unio*—*Epioblasma*, *Toxolasma*, *Bariosta*, *Obliquaria* and *Truncilla*. Of *Alasmodon*—*Lasmigona*, *Amblasmodon*, *Decurambis*, *Sulcularia*, and *Pterosyna* to include *A. complanata*, Say. Of *Anodonta*, the subgenus *Flexipilis*.—A.F.G.

1831. **RAFINESQUE.** Enumeration and account of some remarkable Natural Objects in the Cabinet of Prof. Rafinesque, in Philadelphia. Philadelphia, Nov., 1831.

Some Ohio shells are here mentioned.—A.F.G.

1831. **SHORT,—EATON.** Notice of Western Botany and Conchology, by C. W. Short, M. D., and H. H. Eaton, A. M. <Transylvania Jour. of Medicine, Feb., 1831.

Full notes as to localities of each species are given, but no descriptions; 40 species are mentioned, chiefly *Unionidæ*.—A.F.G.

1832. **ANONYMOUS.** Ohio Shells: a Criticism on Notices of Western Botany and Conchology, by C. W. Short, M. D., and H. H. Eaton, A. M; and Monograph of the Bivalve Shells of the River Ohio, translated from the French of Prof. Rafinesque, by C. A. Poulson, Esq. <Month. Am. Jour. Geo. and Nat. Sci., vol. i., No. 8, pp. 370-377. Phila., Feb., 1832.

1832. **INVESTIGATOR.** Remarks on the article contained in Silliman's Jour. for April, 1832, entitled "Mr. Lea, on the Naiades," by Investigator. <Month. Am. Jour. Geol. and Nat. Sci., vol. i., No. 12, pp., 537-549. June, 1832.

1832. **POULSON.** A Monograph of the Fluvial Bivalve Shells of the River Ohio, containing Twelve Genera and Sixty-eight Species. Translated from the French of C. S. Rafinesque, Prof. Bot. and Nat. Hist. in Transylvania University, by C. A. Poulson, Philadelphia, J. Dobson, 108 Chestnut St., 1832.

This translation by Poulson of the French edition does not contain the plates, but has a colored frontispiece of *Unio verrucosa*, Raf.—A.F.G.

1834. **CONRAD.** New Fresh-water Shells of the United States, with colored illustrations and a Monograph of the genus *Anculotus*, of Say, also a Synopsis of the North American Naiades, by T. A. Conrad, Member Acad. Nat. Sci., Philadelphia. Philadelphia, 1834.

Many species are mentioned by name only, others are accompanied by notes on synonymy, geographical distribution, etc.—A.F.G.

1834. **KIRTLAND.** Observations on the Sexual Characters of the Animals belonging to Lamarck's Family of Naiades, by Jared P. Kirtland, M. D. <Am. Jour. Sci. and Arts, vol. xxvii.,

No. 1, O. S., pp. 117-120, with outline figures. (Title dated July, 1834.)

Observations on Ohio species; a translation in German appeared in Wiegmann's Archiv. fur Naturgeschichte, Berlin, 1836, vol. i., p. 236.—A.F.G.

1834. RAVENAL. Catalogue of Recent Shells, in Cabinet of Edmund Ravenal, M.D. Charlestown, S. C., 1834.

Enumeration of species, with localities only.—A.F.G.

1835-8. CONRAD. Monograph of the Family Unionidæ, or Naiades of Lamarck, of North America, by T. A. Conrad, Memb. Phila. Acad. Nat. Sci., Hon. Memb. Geo. Soc., Pa., Philadelphia.

This Monograph was published in wrappers at intervals, parts i. to xi. inclusive, bearing dates from Dec. 1835 to Nov. 1838. Parts xii. and xiii. were issued without dates, and the publication then discontinued. It contains descriptions of all the species treated, with colored plates, and here will be found the majority of Conrad's species of this family.—A.F.G.

1835. FERUSSAC. Observations, addresses en forme de lettre a MM. Th. Say, C. S. Rafinesque, Is. Lea, S. P. Hildreth, T. A. Conrad, et C. A. Poulson, sur la synonymie des Coquilles bivalves de l'Amérique Septentrionale, et Essai d'une Table de Concordance à ce sujet, par le Baron de Ferussac. <Magasin de Zoologie 1835, Classe V., Nos. 59, 60, pp. 1-36.

Contains complete list of works, and copious notes, but no descriptions.—A.F.G.

1836. LEA. Synopsis of the Unionidæ, by Isaac Lea, 1836, 8vo, pp. 62, Philadelphia. With plate of Unio spinosus, Lea. 2d edition, Phila., 1836; 3d edition, Phila., 1852; 4th edition, Phila., 1870.

1837-41. BINNEY. A Monograph of the Helices inhabiting the United States, by Amos Binney, M. D. <Boston Jour. Nat. Hist., vol. i., No. 4, p. 466, May, 1837; continued, vol. iii., No. 3, p. 353, July, 1840; continued, vol. iii., No. 4, p. 405, Nov., 1841.

Species described and figured.—A.F.G.

1837. HILDRETH. Disease among Shell Fish (Naiades), by S. P. Hildreth. <Am. Jour. Sci. & Arts, O. S., vol. xxxii., No. 1, p. 97.

1837. NATURALIST. Miscellaneous Observations made during a tour in May, 1835, to the Falls of the Cuyahoga, near Lake Erie: extracted from the Diary of a Naturalist. <Am. Jour. Sci. & Arts, O. S., vol. xxxi., No. 1, Jan., 1837, being the date on title page.

A few brief notes, with wood-cut of *Lymnæa stagnalis*, 44 species are named.—A.F.G.

1838. KIRTLAND. Report on the Zoology of Ohio, by Prof. J. P. Kirtland, Cincinnati, Nov. 1, 1838.

This list, which is very complete, enumerates 170 species as belonging to the Fauna of the State, and notes are given upon 32 species.—A.F.G.

1838. SULLIVANT. An Alphabetical Catalogue of Shells, Fossils, Minerals and Zoophytes, in the cabinet of Jos. Sullivant, Columbus, Ohio, 1838, 8vo, pp. 38.

Localities are given for many of the *Unionidae*.—A.F.G.

1839. TAPPAN. Description of some New Shells, by Benj. Tappan, Steubenville, Ohio. <Am. Jour. Sci. & Arts, O. S., vol. xxxv., No. 2, date of title page Jan., 1839.

Unio Sayii, Ward., *Paludina heterostrophæ*, Kirtland, *Physa Sayii*, Tappan, are here described and figured.—A.F.G.

1840. ANTHONY. Descriptions of two New Species of Anculotus, by J. G. Anthony. <Boston Jour. Nat. Hist., vol. iii., pp. 394-395, July, 1840.

Anculotus carinatus and *Kirtlandianus* are described from Kanawha Falls.—A.F.G.

1840. ANTHONY and GRAY. On the Byssus of Unio, by J. G. Anthony, with Notes by J. E. Gray. <Annals Nat. Hist., conducted by Jardine, London, vol. vi., p. 77, Sept., 1840.

- 1840-(44?) HALDEMAN. A Monograph of the Limniades and other Fresh-water Univalve Shells of North America, by S. S. Haldeman, Philadelphia.

This work was issued by the author at intervals. Nos. i. to vii. bear date from July, 1840, to Jan. 1844; No. viii. was issued without date. The work is on a whole a model of excellence, and the plates are executed with the greatest care, which was characteristic of all the work done by Prof. Haldeman.—A.F.G.

1840. SAY. Descriptions of some new Terrestrial and Fluviatile Shells of North America, 1829, 1830 and 1831, New Harmony, Indiana, 1840.

Mrs. Say has here collected some of the descriptions published by her husband in the "Transylvania Journal of Medicine," and "The New Harmony Disseminator of Useful Knowledge."—A.F.G.

- [1840.] SHAFFER. A complete List of Land and Fresh-water Shells found in the immediate vicinity of Cincinnati, Ohio, by David H. Shaffer.

No date is given to the paper which was printed privately, it contains 148 species, the synonymy of the *Unionidæ* is given. Mr. Shaffer writes that the list was published in 1840.—A.F.G.

- 1841-6. PFEIFFER. *Symbolæ ad Historiam Helicorum*, auctore, Dr. Lud. Pfeiffer, Cassel, 1841-46.

1841. VILLA. *Dispositio Systematica Conchyliarum Terrestrium et Fluviatilium quæ adservantur in collectione fratrum Ant. et Jo. Bapt. Villa, etc., Mediolani*, 1841.

Synonymy of many Ohio species given.—A.F.G.

- [1843] [No date.] ANTHONY. List of Land and Fresh-water Shells found chiefly in the vicinity of Cincinnati, by J. G. Anthony.

Second edition published at Cincinnati, Jan. 1, 1843. The first edition was a list only, and embraced 173 species, the second gives 163 species with many synonyms.—A.F.G.

- [No date.] HILDRETH. Catalogue of Fresh-water Shells found near Marietta, Ohio. By S. P. Hildreth.

List only: includes 1 *Cyclas*, 3 *Alasmodontas*, 4 *Anodontas*, and 6 *Unios*.—A.F.G.

- [No date.] HUBBARD. Catalogue of Terrestrial and Fluviatile Shells of Ohio, in the collection of Eber W. Hubbard, Elyria, Ohio.

163 species enumerated with synonymy, but no descriptions.—A.F.G.

1843. BINNEY. Remarks on the Geographical Distribution of Am. Land Shells, by Dr. Amos Binney. <Proc. Boston Soc. Nat. Hist., vol. i., p. 142, Oct., 1843.

1843. DEKAY. Zoology of New York, Part v., Mollusca, by J. E. DeKay. 4to, pp. 271, 40 plates, Albany, 1843.

See lists of Extra-limital Species, which contain notes on Ohio species.—A.F.G.

1843. MUSSEY. [Catalogue of the] Ohio Valley Shells, by R. D. Mussey.
 <Proc. National Institute, Washington, p. 297, 1843.

No descriptions, typographical errors numerous.—A.F.G.

- 1843-(59?). REEVE. Conchologica Iconica, or Illustrations of Shells of Molluscous Animals, by Lovell A. Reeve, London.

Published at irregular intervals, full descriptions and colored plates given, 1843 (59?).—A.F.G.

1845. CHENU. Bibliothèque Conchylogique Première Serie, vol. iii., Paris, 1845.

This volume contains the writings of Say, Conrad, Rafinesque and Rackett, translated into French; these all contain references to the Shells of Ohio.—A.F.G.

1845. WHEATLEY. Catalogue of the Shells of the United States, with their localities, by Chas. M. Wheatley, New York, 1845.

Localities only given, no descriptions.—A.F.G.

- 1847-76. PFEIFFER. Monographia Heliceorum Viventium, auctore, Dr. Lud. Pfeiffer, Cassel. Vol. i., 1847-8; vol. ii., 1848; vol. iii., 1853; vol. iv., 1859; vol. v., 1868; vol. vi., 1868; vol. vii., 1875; vol. viii., 1876.

This great work contains many references to the Helicidæ of the United States, and special localities are given in many instances.—A.F.G.

1849. WESTERN ACADEMY. Catalogue of the Unios, Alasmodontas and Anodontas of the Ohio River and its Northern Tributaries, adopted by the Western Acad. of Nat. Sci., of Cincinnati, Jan., 1849.

Contains much information in regard to synonymy of these groups.—A.F.G.

1850. ANTHONY. Descriptions [of New Melanians], by J. G. Anthony.
 <Proc. Boston Soc. Nat. Hist., vol. iii., pp. 360-363, Nov., 1850.

Ohio species mentioned here, and of which descriptions are given: *Melania inornata*, *tracta*, *brevispira*, *elata*, *napella*, *cuspidata*, *succinulata*.—A.F.G.

- 1851-7. BINNEY,—GOULD. The Terrestrial Air-breathing Mollusks of the United States, and the adjacent Territories of North America, described and illustrated by Amos Binney, edited by A. A. Gould, Boston. Vols. i., ii., 1851; vol. iii. (plates), 1857.

In vol. i. will be found many general remarks upon classification and geographical distribution by the author, also on special anatomy by Dr. Jos. Leidy, all the species known to the date of publication are here figured by the able Alex. Lawson, and others, and full detailed descriptions given by Binney or Gould. Wood-cuts illustrate the lingual dentition of many species.—A.F.G.

1851. KIRTLAND. Remarks on the Sexes and Habits of some of the Acephalous Bivalve Mollusca, by J. P. Kirtland.—<Proc. Am. Assoc. Adv. Sci., vol. v., pp. 85-91, Washington, D. C.

Notes upon byssus, sexual differences and localities of many species.—A.F.G.

1851. NEWBERRY. Geographical Distribution of certain species of Fluvial and Terrestrial Shells, by J. S. Newberry, M.D. <Proc. Am. Assoc. for Adv. Sci., vol. v., p. 105. 1851.

6 Species mentioned with localities.—A.F.G.

1852. JAY. A Catalogue of the Shells arranged according to the Lamarckian System, etc., contained in the Collection of John C. Jay, M.D. Fourth edition, with Supplement, New York, 1852.

This work contains much upon synonymy, but no descriptions. Three previous editions have been issued, the 1st dated Aug. 1, 1835; 2d, 1836; and 3d, 1839; all published in New York. Many discrepancies occur in synonymy in the earlier editions, owing to improved classification.—A.F.G.

1852. KUSTER. Die Gattung Paludina Hydrocæna und Valvata, von Dr. H. Kuster. [In Martini and Chemnitz ed., Nov.]

1852. PRIME. Descriptions of Cycladidæ, by Temple Prime. <Proc. Boston Soc. Nat. Hist., vol. vi., p. 155, March, 1852.

C. gracilis, and *C. solidula*, and *Pisidium obscurum*, Prime, from Ohio, with many from other States described.—A.F.G.

1852. PRIME. Monograph of the species of *Pisidium* found in the United States of North America, with figures, by Temple Prime. <Boston Jour. Nat. Hist., vol. vi., No. 3, p. 348. June, 1852.

1853. ANTHONY, J. G. <Proc. Phila. Acad. Nat. Sci., vol. ii., 1853.

Lists of Ohio Shells without descriptions.—A.F.G.

1853. CONRAD. Synopsis of the Family of Naiades of North America, with Notes, by T. A. Conrad. <Proc. Phila. Acad. Nat. Sci., vol. vi., pp. 244-269, Feb., 1853.

1853. PRIME. Notes on the Species of *Cyclas* found in the United States, with descriptions and wood cuts, by Temple Prime. <Proc. Boston Soc. Nat. Hist., vol. iv., pp. 271-285, March, 1853.
1854. ANTHONY. Descriptions of New Fluvialile Shells of the Genus *Melania* of Lamarck, from the Western States of North America, by J. G. Anthony, Esq. <Annals N. Y. Lyc. Nat. Hist., vol. vi., March and April, 1854.

New species described from Ohio are *M. ioata*, *altipeta*, *tecta*, *neglecta*, and *gracilior*.—A.F.G.
- 1854-5. BRITISH MUSEUM Catalogues of Mollusca. Catalogue of Conchifera or Bivalve Shells. Part II., Petricoladæ and Corbiculadæ, by G. P. Deshayes, 1854. Catalogue of Pulmonata, or Air-breathing Mollusca. Part I., by J. E. Gray and L. Pfeiffer, 1855.
1854. KIRTLAND. New locality of *Limnæa megasoma*, Say, by J. P. Kirtland. <Annals of Science, etc., including Trans. Cleveland Acad. Nat. Sci., conducted by Hamilton A. Smith, A. M., Cleveland, vol. ii., No. 1, Jan., 1854.

From Alliance, Mahoning river.—A.F.G.
1858. BINNEY. The Complete Writings of Thos. Say on the Conchology of the United States, edited by W. G. Binney, New York, 1858.

This invaluable work contains a collection of all the descriptions of recent shells published by Mr. Say, either privately or in obscure publications, now unavailable. The edition is fully illustrated with plates.—A.F.G.
1858. HIGGINS. A Catalogue of the Shell-bearing species of Mollusca inhabiting the vicinity of Columbus, Ohio, with some Remarks thereon, by Frank Higgins, Sept., 1858.

This list enumerates 144 species and gives localities fully. No descriptions are included.—A.F.G.
1859. BINNEY. Terrestrial Air-breathing Mollusks of the United States, and the Adjacent Territories of North America, by W. G. Binney, vol. iv. <Boston Jour. Nat. Hist., vol. vii., 1859.

- 1863-4. BINNEY. Bibliography of North American Conchology previous to year 1860, prepared for Smithsonian Institution, by W. G. Binney. Part I., American Authors, pp. 658. <Smithsonian Misc. Collections, vol. v., March, 1863. Part II., Foreign Authors, pp. 302. <Smithsonian Misc. Collections, vol. ix., June, 1864.
1864. BINNEY AND TRYON. Complete Writings of Constantine Smaltz Rafinesque, on Recent and Fossil Conchology, edited by W. G. Binney and Geo. W. Tryon, Jr. New York, 1864, 8vo, pp. 96, with plate.
1865. ANTHONY. Descriptions of New Species of North American Unionidæ, by J. G. Anthony. <Am. Jour. Conch., vol. i., pt. 2, pp. 155-164, April, 1865.
Unio distans, Anthony, from Ohio, and other species described.—A.F.G.
- 1865-73. BINNEY, BLAND, TRYON and PRIME. Land and Fresh-water Shells of North America. Part I., Pulmonata Geophila, by Binney and Bland, 1869. Part II., Pulmonata Limnophila, and Thalassophila, by W. G. Binney, 1865. Part III., Ampullaridæ, Valvatidæ, Viviparidæ, etc., by W. G. Binney, 1865. Part IV., Strepomatidæ, by Geo. W. Tryon, Jr., 1873; and Corbiculadæ; by Temple Prime, 1865. <Smithsonian Misc. Collections, 1865-73.
1865. TRYON. Observations on the Family Strepomatidæ, by Geo. W. Tryon, Jr. <Am. Jour. Conch., vol. i., pt. 2, pp. 97-135, April, 1865.
Classification and Geographical Distribution of the Family treated.—A. F. G.
- 1865-6. TRYON. Monograph of the Family Strepomatidæ; by Geo. W. Tryon, Jr. <Am. Jour. Conch., vol. i., pt. 4, pp. 299-341, Oct., 1865; vol. ii., pt. 1, pp. 14-52, Jan., 1866; vol. ii., pt. 2, pp. 115-133, April, 1866.
- 1866-8. TRYON. Monograph of the Terrestrial Mollusca of the United States, by Geo. W. Tryon, Jr. <Am. Jour. Conch., vol. ii., pt. 3, pp. 218-277, July, 1866; vol. ii., pt. 4, pp. 306-327, Oct., 1866; vol. iii., pt. 1, pp. 34-80, April, 1867; vol. iii., pt. 2, pp. 155-181, Sept. 1867; vol. iii., pt. 4, pp. 298-324, April, 1868; vol. iv., pt. 1, pp. 5-22, June, 1868.

- 1867-8. MORSE. The Land Snails of New England, by E. S. Morse. <Am. Nat., vol. i., pp. 5-16, 95-100, 150-151, 186-188, 313 315, 411-414, 541-547, 606-609, 666-672.

This article contains excellent wood-cuts of all the species, many of which are referred to from Ohio; a general account of the habits of snails, and of the anatomy of *Helix albolabris*, Say, is given in the early portion of the paper which is accompanied by a good plate.—A.F.G.

- 1868-9. LEWIS. Observations on *Melantho*, by James Lewis, M. D. <Am. Jour. Conch., vol. iv., pt. 3, pp. 133-136, Nov. 1868; vol. v., pt. 1, pp. 33-36, July, 1869.

Notes upon *Melantho ponderosa* and *obesa* included.—A.F.G.

- 1869-70. MORSE. Our Common Fresh-water Shells, by Edward S. Morse. <Am. Nat., vol. iii., pp. 530-535, Dec., 1869, and pp. 648-651, Feb., 1870.

Familiar account of many species with excellent wood-cuts.—A.F.G.

1872. BYRNES. List of Land and Fresh-water Shells found in the Vicinity of Cincinnati; also the Unionidæ of the Ohio River and its Northern Tributaries within the State of Ohio, by R. M. Byrnes. Dec., 1872.

Privately printed, this list embraces 200 species.—A.F.G.

1874. MILLER. Remarks on *Unio Sayii*, and *Unio Camptodon*, before the Cincinnati Society of Natural History at the Meeting in May, by Dr. C. A. Miller. <Cin. Quar. Jour. Sci., vol. i., pp. 244-247, July, 1874.

Unio sayii to be placed in Ohio list, and *camptodon* to be expunged.—A.F.G.

1875. LEWIS. Descriptions of New Species of American Land and Fresh-water Shells, by James Lewis, M.D. <Proc. Phila. Acad. Nat. Sci., 1875, pp. 334-337.

Melantho obesus described from Ohio Canal at Columbus.—A.F.G.

1876. HARPER and WETHERBY. Catalogue of the Land and Fresh-water Mollusca found in the Immediate Vicinity of Cincinnati, O., by Geo. W. Harper, and A. G. Wetherby. Feb., 1876.

This list contains 204 species. The more obvious errors in the list are the omission of the family Anculosa, and the inclusion of *Margaritana confragosa*, Say, which belongs to the Fauna of Indiana. It was described by Say, from specimens obtained in Fox river, a tributary of the Wabash, and the quotation by Lea in his "Synopsis," "1870," of Ohio river, as the source of this species is without doubt erroneous.—A.F.G.

1876. List of the Mollusca Existing in the Neighborhood of Cincinnati.
 <Publications of the O. G. B. III., Aug. 1876.

This list, by C. R. Judge, Wm. Doherty, and two or three other high-school pupils, writing under the *nom de plume* of "Our Geological Boys," contains 211 species, some of which are referred to as possible varieties of other species.—A.F.G.

1877. LEWIS. Unionidæ of Ohio and Alabama, by James Lewis, M.D.
 <Proc. Phila. Acad. Nat. Sci., 1877, pp. 26-36.

A comparison of the Faunas of the two water systems, with many critical notes.—A.F.G.

1878. ANONYMOUS. Note on *Hyalina milium*. <Jour. Cin. Soc. Nat. Hist., vol. i., p. 23, April, 1878.

Occurrence in Ohio and Kentucky noted.—A.F.G.

1878. BINNEY. The Terrestrial Air-breathing Mollusks of the United States and the Adjacent Territories of North America, described and illustrated by W. G. Binney, vol. v. <Bull. Mus. Comp. Zool., vol. iv., Cambridge, July, 1878.

A complete manual of all the land shells.—A.F.G.

1878. CALKINS. Multiplication of Species in the Families Unionidæ and Strepomatidæ, by W. W. Calkins. <Valley Naturalist (St. Louis), Jan., 1878.

Notes as to the great number of specific forms in these families which must be stricken out, and placed in the ranks of synonyms only.—A.F.G.

1878. CALKINS. W. W. Calkins on a New Species of Succinea.
 <Valley of Naturalist (St. Louis), Nov., 1878.

S. calumetensis described from Cook Co., Illinois, also note on *S. retusa*, Lea.—A.F.G.

1878. CALL. Mode of Distribution of Fresh-water Mussels, by R. E. Call. <Am. Nat., vol. xii., pp. 472-473, July, 1878.

Unio rubiginosus and *gibbosus*, probably introduced from Western waters to New York by the Erie Canal, also notes the occurrence of *Unio pressus*, a western species in a small lake near Herkimer, N.Y.—A.F.G.

1878. DOHERTY. Description of Two New Gasterepods, by William Doherty. <Quar. Jour. of Conch., vol. i., No. 15, pp. 341-342, with plate.

Somatogyrrus trochis, from Ohio river, and *Cionella (Zua) morseana*, from Hamilton Co., Ohio, are described.—A.F.G.

1878. JUDGE. Description of New Species of Pupa, by Chas. R. Judge. <Jour. Cin. Soc. Nat. Hist., vol. i., pp. 39-40, with figure. April, 1878.

Pupa Cincinnatiensis described, this paper also appeared in the Quar. Jour. Conch., vol. i., No. 15, May, 1878, pp. 343-344.—A.F.G.

- 1880-81. WETHERBY. On the Geographical Distribution of Certain Fresh-water Mollusks of North America, and the probable causes of their Variations, by A. G. Wetherby. <Jour. Cin. Soc. Nat. Hist., vol. iii., pp. 317-324, Jan.-June, 1880, also vol. iv., pp. 156-166, July, 1881.

Treats of the distribution of the families Strepomatidæ and Unionidæ.—A.F.G.

1881. BYRNES, R. M. *Sphærium occidentale*, Prime. <Jour. Cin. Soc. Nat. Hist., vol. iv., p. 345.

Note of occurrence near Cincinnati.

1881. CALL. Notes on *Succinea campestris*, and *S. aurea*, by R. E. Call. <Am. Nat., vol. xv., pp. 391-392, May, 1881.

Succinea aurea, an Ohio species, to be added to the species of Western and Central New York, here noted from Richfield Springs, N. Y.—A.F.G.

1881. EDITOR [F. W. LANGDON]. *Vivipara contectoides*, Say. <Jour. Cin. Soc. Nat. Hist., vol. iv., p. 345.

Record of specimens "planted" near Cincinnati.

1881. WETHERBY. Some Notes on American Land Shells, No. II., by A. G. Wetherby. <Jour. Cin. Soc. Nat. Hist., vol. iv., pp. 323-335, Dec. 1881.

SUBKINGDOM CŒLENTERATA.

CLASS HYDROZOA.

1882. HUNT, J. H. *Vide* CRUSTACEA, 1882, p. 38, *ante*.

SUBKINGDOM PROTOZOA.

CLASS SPONGIA.

1882. HUNT, J. H. *Vide* CRUSTACEA, 1882, p. 38, *ante*.

CLASS INFUSORIA.

1882. HUNT, J. H. *Vide* CRUSTACEA, 1882, p. 38, *ante*.

CLASS RHIZOPODA.

1882. HUNT, J. H. *Vide* CRUSTACEA, 1882, p. 38, *ante*.

THE MYCOLOGIC FLORA OF THE MIAMI VALLEY, O.

By A. P. MORGAN.

FUNGI, Linn.

Fungi are Thallophytes which grow upon organic substances, usually dead or decaying animal or vegetable matter, and derive their nourishment from them; they are destitute of chlorophyll, the green coloring matter of plants, and are therefore incapable of assimilation.

The whole process of development of a fungus may be divided into two periods; first, from the spore is produced a *mycelium*; secondly, out of the mycelium the *fructification* subsequently arises. The mycelium consists of filaments simple or branched, and single or variously associated. The mycelium creeps in or upon the substratum which nourishes it out of which it absorbs the useful materials. The fructification consists of simple or branched filaments, bearing the spores at their extremities; these threads are either separate and free from each other, or they grow closely compacted together forming a *hymenium*. The hymenium is either naked and exposed, and borne upon a *receptacle*, or it is inclosed in a *peridium* or a *perithecium*. The spores are either produced naked at the extremities of the filaments or they arise inside their sac-like swollen terminal cells; in the former case the supporting cell or filament takes the name of *basidium*, in the latter it is called an *ascus*.

TABLE OF CLASSES OF FUNGI.

A. Spores naked.

a. Hymenium present.

1. HYMENOMYCETES.—Hymenium free, mostly naked or soon exposed.
2. GASTEROMYCETES.—Hymenium inclosed in a peridium, which is ruptured when mature.

b. Hymenium absent.

3. CONIOMYCETES.—Spores mostly terminal on inconspicuous threads.
4. HYPHOMYCETES.—Spores on conspicuous threads.

B. Spores contained in asci.

5. PHYSOMYCETES.—Fertile cells seated on threads not compacted into a hymenium.
6. ASCOMYCETES.—Asci formed from the fertile cells of a hymenium.

CLASS I.—HYMENOMYCETES.

Hymenium free, mostly naked, or, if inclosed at first, soon exposed ; spores naked, mostly quaternate, on distinct spicules.—Cooke.

TABLE OF ORDERS OF HYMENOMYCETES.

A. *Hymenium effigurate.*

1. AGARICINI.—Hymenium spread over the surface of gills or lamellæ.
2. POLYPOREI.—Hymenium lining the interior of tubules or pores.
3. HYDNEI.—Hymenium consisting of teeth, tubercles or papillæ.

B. *Hymenium lævigatæ.*

4. THELEPHOREI.—Hymenium horizontal and inferior.
5. CLAVARIEI.—Hymenium investing a clavate or branched body.
6. TREMELLINEI.—Hymenium investing a lobed or convolute gelatinous body.

ORDER I.—AGARICINI.

Hymenophore inferior, lamellose. Lamellæ radiating from the center or from the stipe, covered on both surfaces with basidia and paraphyses ; basidia 4-sporous at the apex.

TABLE OF GENERA OF AGARICINI.

A. *Fungi fleshy, putrescent.*

1. AGARICUS.—Lamellæ membranaceous, soft, persistent.
2. COPRINUS.—Lamellæ dissolving into a black fluid.
3. BOLBITIUS.—Lamellæ becoming moist ; spores subferruginous.
4. CORTINARIUS.—Veil of cobwebby threads ; lamellæ pulverulent with subochraceous spores.
5. PAXILLUS.—Lamellæ easily separating from the hymenophore ; spores colored.
6. HYGROPHORUS.—Lamellæ somewhat waxy.
7. LACTARIUS.—Lamellæ with a milky juice.
8. RUSSULA.—Lamellæ rigido-fragile.
9. CANTHARELLUS.—Lamellæ with the edge obtuse.

B. *Fungi tough, persistent, subcoriaceous.*

10. MARASMIUS.—Fungi marcescent, reviving when wet.
11. LENTINUS.—Fungi fleshy-tough ; lamellæ lacero-dentate.
12. PANUS.—Fungi fleshy-coriaceous ; lamellæ entire.
13. TROGIA.—Fungi tough, soft ; lamellæ fold-like, the edge crisp.

14. SCHIZOPHYLLUM.—Fungi coriaceous; lamellæ with the edge split and revolute.

15. LENZITES.—Fungi corky; lamellæ coriaceous.

GENUS I.—AGARICUS, Linn.

Lamellæ membranaceous, soft, persistent, not tough nor deliquescent, easily separable into two layers, the edge acute; trama subfloccose; universal veil never cobwebby.

The subgenera of the genus Agaricus are arranged in five series, according to the color of the spores, as follows:

1. LEUCOSPORI.—Spores white or whitish.
2. HYPORHODII.—Spores rosy or reddish.
3. DERMINI.—Spores subferruginous, argillaceous or ochraceous.
4. PRATELLI.—Spores purplish or brown.
5. COPRINARIИ.—Spores black.

TABLE OF THE SUBGENERA OF LEUCOSPORI.

A. Stipe central and veil present.

a. Lamellæ free from the stipe.

1. AMANITA.—Universal veil discrete from the epidermis of the pileus.
2. LEPIOTA.—Universal veil concrete with the epidermis of the pileus.

b. Lamellæ attached to the stipe.

3. ARMILLARIA.—Veil partial, annuliform.

B. Stipe central, veil absent.

c. Stipe fleshy or fibrous.

4. TRICHOLOMA.—Lamellæ sinuate.
5. CLITOCYBE.—Lamellæ decurrent.

d. Stipe cartilaginous, lamellæ not decurrent.

6. COLLYBIA.—Pileus convexo-plane, the margin at first involute.
7. MYCENA.—Pileus campanulate, the margin straight.

e. Stipe cartilaginous, lamellæ decurrent.

8. OMPHALIA.—Pileus more or less umbilicate.

C. Stipe excentric or none.

9. PLEUROTUS.—Pileus irregular or sessile.

SUBGENUS I.—AMANITA, Fr.

Spores white. Universal veil (the *volva*) at first contiguous, discrete

from the epidermis of the pileus. Hymenophore discrete from the stipe. All terrestrial.

A. Annulus present.

a. Volva entire, 1, 2.

b. Volva circumscissile, 3, 4.

c. Volva broken up, 5.

B. Annulus absent, 6, 7.

A. *Annulus manifest, superior.*

a. *Volva dehiscing at the apex; the limb free, persistent.*

1. A. CÆSAREUS, Scop.—Pileus hemispheric, expanded, somewhat orange-color; the margin striate; the flesh yellowish. Stipe somewhat ventricose, flocculose, stuffed with cottony fibres; the volva and annulus lax. Lamellæ free, luteous.

In woods. This magnificent Agaric appears to be rare in the Miami Valley; it is not in Lea's Catalogue; I have met with it as yet only at the "Pinnacles" near Dayton. My figures vary in size, with the pileus 4-6 in. in diameter, and the stipe 5-8 in. in height. The thick volva is about the size of a hen's egg, and of like shape and color; it is burst at the apex by the growth of the pileus and remains entire about the base of the stipe. The pileus is said to vary in color, being found yellow, red and copper-color. This is the most showy of Agarics and well deserves the appellation "Fungorum Princeps" (*Kaiserling*, vulgo dictus). It has been celebrated as an article of diet from the most ancient times: "Cibus Deorum," Clus. It was known to the ancient Romans under the name "Boletus," and is said to have had the honor, under Agrippina's orders, and Locusta's cookery, of poisoning the emperor Claudius; in memory of which event, it is now called *Agaricus cæsareus*, Cæsar's Agaric. It is the only ancient mushroom which we at once recognize by the description of it. Pliny says "it originates in a volva or purse, in which it lies at first concealed as in an egg; breaking through this, it rises upwards on its stalk; the color of the cap is red; it takes a week to pass through the various stages of its growth and declension."

2. A. VERNUS, Fr.—White. Pileus ovate then expanded, somewhat depressed, viscid; the margin orbicular, even. Stipe stuffed, then hollow, equal, floccose; the limb of the volva free and closely sheathing the stipe; annulus reflexed, tumid. Lamellæ free.

The spring Agaric is found in moist woods in spring and early summer; it is quite common. Pileus 2-3 in. in diameter, the stipe 4-6

in. high. Dr. Cooke and Prof. Peck both give this as a species, though Fries considers it a variety of *A. phalloides*. It is readily distinguished from white forms of *A. vaginatus*, or of *A. volvatus* by the presence of the annulus.

b. Volva definitely circumscissile, the margined base persistent, the upper part separating into thick warts upon the pileus.

3. *A. MUSCARIUS*, Linn. Pileus convexo-expanded; the margin striate; the flesh beneath the viscid cuticle yellowish. Stipe cobwebby within, soon hollow, ovate-bulbous at the base; the volva adnate, concentrically scaly-margined; the annulus superior, lax. Lamellæ reaching the stipe and decurrent in striæ. Spores $.008 \times .006$ mm.

In woods, not abundant in our region. This species does not appear in Lea's Catalogue, but I have met with it in all localities; it is very common in the Eastern States. Pileus 3-6 in. broad, stipe 4-8 in. high. The color of the European plant is commonly orange or scarlet, but in this country it is usually bright yellow, sometimes varying to whitish. The lamellæ are white, sometimes with a yellowish tint. It is always to be distinguished by the scaly-margined bulbous base of the stipe. This plant, as its name indicates, is called the "Fly Agaric," because its flesh has been used to poison flies, bugs, etc. In sufficient quantities, it is a highly narcotic violent poison, producing delirium and death. It is habitually used by some of the Tartar tribes of Eastern Asia to produce intoxication: a curious account of this may be found in Goldsmith's Letters of a "Citizen of the World," letter xxxii. This statement has recently been verified by George Kennan in a volume entitled "Tent-life in Siberia," page 203.

4. *A. PANTHERINUS*, DC.—Pileus convexo-expanded; the margin striate; the flesh beneath the viscid cuticle white. Stipe stuffed, then hollow, nearly glabrous; the base ochreate by the volva, the margin of which is entire and obtuse. Lamellæ attenuate, free. Spores $.0076 \times .0048$ mm.

In pastures along the borders of woods. Pileus 4-6 in. in diameter, stipe 5-7 in. long. Pileus white or brownish, never yellow or red, when dry, soft to the touch like kid leather; the annulus is usually midway of the stipe or distant from its apex, it is often found deflexed or with its margin turned upward; the volva invests the base of the stipe smoothly, and has a separable or free margin, which is bluntly obtuse or truncate. The species is reputed poisonous.

c. *The whole volva friable, broken up into scales and warts.*

5. *A. RUBESCENS*, Pers.—Pileus convexo-expanded, strewn with unequal mealy warts; the flesh becoming reddish. Stipe stuffed, tapering upward, scaly; the annulus superior, entire. Lamellæ attenuate, reaching the stipe and decurrent in striæ. Spores $.0076 \times .0058$ mm.

On hills and bluffs in woods. Pileus 3.5 in. in diameter, stipe 3.5 in. long. The color of the pileus is dirty-reddish, pale flesh-color or alutaceous; when fully grown the margin is often striate; it is characterized by the reddish flesh. It is distinguished from all the other *Amanitas* here enumerated by the complete absence of the volva about the base of the stipe. It is commonly classed among the suspicious fungi, though by some said to be edible.

B. *Annulus absent.*

6. *A. VOLVATUS*, Peck.—Pileus fleshy, convex, then expanded, sprinkled with small floccose scales, whitish, the disk pale brown; the margin striate. Stipe equal or slightly tapering upward, stuffed, floccose-scaly, whitish; the volva large, firm, loose. Lamellæ close, free, white. Spores somewhat elliptic, $.010 \times .007$ mm.

In moist woods; quite abundant in spring and summer. Pileus 2.4 in. broad, stipe 3.7 in. high, the volva $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, and 1 in. in diameter. My figures are much larger than Prof. Peck's typical plant. This is a very elegant species, well marked by the absence of the annulus, and the presence of a large, thick, elongated volva. I find the upper part of the volva sitting like a cap on the disk of the pileus, or hinged on one side, and resting against the stipe, sometimes it has fallen off on to the ground; commonly, the volva is only burst at the apex, and presents a free lobed margin. A dense mealiness invests the pileus and stipe. The native American species have scarcely as yet been tested in reference to their qualities as food; such experiments should be instituted with great caution. I find only the Morel and the Common Mushroom eaten by people in the Miami Valley; these two fungi are both delicious articles of diet.

7. *A. VAGINATUS*, Bull.—Pileus thin, campanulate then explanate; the margin membranaceous, pectinate-sulcate. Stipe hollow, tapering upward, fragile, floccose-scaly; the volva sheathing, loose. Lamellæ free, white. Spores oval, $.0096 \times .0081$ mm.

In woods, common throughout the season from spring to autumn. Pileus 2.3 in. in diameter, stipe 4.6 in. in height, the volva 1 - $1\frac{1}{2}$ in. long.

The pileus is commonly brownish or tawny, but is sometimes white, and sometimes quite a deep brown, especially on the disk ; the pileus and stipe both are usually quite smooth and glabrous. The volva is commonly concealed beneath the surface of the ground, and is liable to be overlooked. Badham says this species is edible, but it was formerly classed among suspicious fungi.

NOTE.—*A. virosus*, Fr., of Lea's Catalogue, has been omitted because it does not appear to have been recorded elsewhere in the Eastern U. S., and because I have never met with it in the Miami Valley ; it seems scarcely possible that I should not have found so conspicuous a fungus. I have an *Amanita* figured, which is mouse-color, and resembles *A. strangulatus*, Fr., but the spores are curved and apiculate, and very different in measurement from the latter ; having had but the single specimen, I can not venture to characterize it. Specimens of *Amanitas*, differing from the seven here described, are earnestly desired by the writer.

A. P. M.

SUBGENUS II.—LEPIOTA, Fr.

Spores white (*green* in No. 10). Hymenophore discrete from the stipe. Universal veil concrete with the epidermis of the pileus. Lamellæ free (except in No. 21), often remote. Terrestrial.

A. Pileus dry, scaly.

a. Annulus movable.

a'. Pileus brownish, 8, 9.

b'. Pileus whitish, 10, 11.

b. Annulus fixed.

c'. Pileus reddish, 12-14.

d'. Pileus blackish, 15, 16.

e'. Pileus whitish, 17, 18.

B. Pileus dry, granulose, 19-21.

C. Pileus viscid, 22.

A. Pileus dry, scaly.

a. Annulus movable.

a'. Pileus reddish brown.

8. A. PROCERUS, Scop.—Pileus fleshy, soft, ovate, then explanate, umbonate ; cuticle thick, torn into seceding scales. Stipe hollow, tall, bulbous, variegated, with appressed scales. Lamellæ remote, spores .0152×.0076 mm.

Along the borders of woods and in pastures. Pileus 3-5 in. broad, stipe 5-9 in. high. The pileus is tough, dry and strongly umbonate, the cuticle being reddish brown, and broken so that the surface resembles brown shaggy leather. The stipe is brown-scaly, with some times peculiar snake-like spots.

9. *A. RHACODES*, Vitt.—Pileus fleshy, soft, globose, then explanate or depressed; the cuticle thin, reticulate, broken up into persistent scales. Stipe hollow, even, bulbous; the bulb ample, at first margined. Lamellæ remote. Spores $.0064 \times .0046$ mm.

In pastures and meadows. Pileus 3-5 in. in breadth, stipe 5-9 in. high, of the size of the preceding species; it is also of the same reddish-brown color. But it is not umbonate, the disk being depressed or somewhat umbilicate; the flesh grows reddish after being broken or bruised; the stipe is never spotted. According to Worthington Smith's measurement, there is a great difference in the size of the spores. Prof. Peck expresses doubts as to this species being found in this country, but I have had specimens which I confidently referred here.

b'. Pileus white or whitish.

10. *A. MORGANI*, Peck.—Pileus fleshy, soft, globose, then explanate; the cuticle breaking up into seceding scales. Stipe cobwebby-stuffed, somewhat bulbous, tapering upward. Lamellæ remote, at first white, then changing to greenish. Spores subelliptic *greenish*, $.010-.012 \times .007-.008$ mm. (See Plate II.)

Open, dry, grassy grounds, in pastures and along the roadsides. Pileus white, or the cuticle alutaceous, commonly 5-9 in. in diameter, the stipe 6-8 in. long, though larger specimens are sometimes found. This is the most conspicuous Agaric in the meadows and pastures of the Miami Valley; it appears to flourish from spring to autumn whenever there is abundance of rain. It is readily recognized by its green spores, by which it is remarkably distinguished from all other Agarics. See article by Prof. Chas. H. Peck, in *Botanical Gazette*, for March, 1879, also note by the writer in the September number.

11. *A. MASTOIDEUS*, Fr.—Pileus somewhat fleshy, soft, ovate-expanded, umbonate; the umbo prominent; cuticle thin, seceding in papillæ. Stipe hollow, slender, tapering equally from the bulb. Lamellæ very remote, pallid.

About old stumps in open woods. Pileus $1\frac{1}{2}$ - $2\frac{1}{2}$ in. across, stipe about

3 in. high; the margin in my figure is thin and striate; the color is white, with a sordid or alutaceous cuticle seceding up to the conspicuous umbo.

b. *Annulus fixed.*

c'. *Pileus with reddish or reddish-brown scales.*

12. *A. ACUTESQUAMOSUS*, Weinm.—Pileus fleshy, obtuse, at first hirtifloccose; then echinate, with erect acute squarrose scales. Stipe stout, bulbous. Lamellæ approximate, lanceolate, simple. Spores with a nucleus on one side, oblong $.0042 \times .0028$ mm.

In woods in rich soil about old stumps. Pileus 2-3 in. broad, reddish-brown, with darker squarrose scales; the stipe 3-4 in. high, the bulb sometimes with a crenate margin. Veil clinging to the margin of the pileus, and finally forming an ample annulus. Our plant seems to differ from the European one, especially in the nature of the bulb.

13. *A. RUBRO-TINCTUS*, Peck.—Pileus fleshy, soft, convex, then explanate; cuticle reddish, fibrose-lacerate. Stipe hollow, glabrous, somewhat bulbous, tapering upward; annulus persistent. Lamellæ free, white.

Among the old leaves in rich woods. Pileus $1\frac{1}{2}$ -3 in. broad, stipe 3-4 in. long. This is a very beautiful plant; the pileus is bright red, and the stipe white, smooth and shining, the cuticle breaks up into silky fibres, which commonly remain.

14. *A. AMERICANUS*, Peck.—Pileus convex, umbonate; the margin obscurely striate. Stipe glabrous, gradually enlarged below into a long sub-ventricose bulb-like base. Lamellæ free.

On lawns and elsewhere on grassy grounds. Pileus 2-3 in. broad, stipe 3-4 in. high. The whole plant when handled or in drying changes to a dull pinkish-red color. The frail annulus is sometimes carried away upon the margin of the pileus.

d'. *Pileus with blackish or blackish-brown scales.*

15. *A. FUSCOSQUAMEUS*, Peck.—Pileus convex, rough with erect pointed blackish-brown scales. Stipe floccose, thickened at the base. Lamellæ free, white. Spores $.0076 \times .0036$ mm.

In rich woods among the leaves. Pileus $1\frac{1}{2}$ -2 in. broad, stipe 2-3 in. long. All parts of the plant somewhat whitish at first turn black in handling.

16. *A. FELINUS*, Pers.—Pileus fleshy, thin, the umbo and the scales

blackish. Stipe hollow, fragile, rather equal, floccose-scaly; the annulus fugacious. Lamellæ approximate, white. Spores $.0055 \times .0035$ mm.

In woods. Pileus 1-2 in. broad, stipe about 2 in. long. This is a variety of *A. clypeolarius*, Bull, according to Fries.

e'. Pileus with whitish or alutaceous scales.

17. *A. CRISTATUS*, A. & S.—Pileus slightly fleshy, campanulate, obtuse; cuticle at first contiguous, then seceding in subgranulose scales. Stipe hollow, slender, equal, silky-fibrillose; the annulus seceding. Lamellæ free, at length remote.

In woods among the old leaves. Pileus 1-2 in. broad, stipe 2-3 in. high. This plant is remarkable for its offensive odor. The pileus is whitish, alutaceous or yellowish, it is fragile, and often split and irregular; the stipe is curved or crooked and floccose.

18. *A. MIAMENSIS*, n. sp.—White. Pileus somewhat fleshy, convex then explanate, even, scaly. Stipe hollow, glabrous, nearly equal; the annulus fragile. Lamellæ approximate. Spores $.006 \times .003$ mm. (See Plate III.)

In woods upon the old leaves. Pileus $1-1\frac{1}{2}$ in. in diameter, stipe about 2 in. long. This plant differs from *A. ermineus*, Fr., in its habitat, and in the pileus being scaly, and the stipe glabrous.

B. Pileus dry, granulose.

19. *A. NAUCINUS*, Fr.—Whitish. Pileus fleshy, soft; cuticle, thin, glabrous, crumbling into granules; the center umbonate, even. Stipe rather hollow, fibrillose, tapering upward from the thickened base; annulus thin, seceding. Lamellæ free, approximate.

On slopes and grassy grounds. Pileus 4-5 in. broad, stipe 3-4 in. high, and nearly an inch thick at the base. I have seen very few specimens of this plant, and have not had an opportunity to examine the spores; they are said by Fries to be globose. A similar plant is called *A. naucinoides* by Prof. Peck; in it the spores are subelliptic, and $.0080 \times .0056$ mm.

20. *A. CARCHARIAS*, Pers.—Pileus fleshy, convex, then plane, umbonate, granulose, flesh-color. Stipe stuffed, then hollow, somewhat bulbous, scaly, concolorous. Lamellæ attached, pure white.

In woods among the old leaves, not common. Pileus 1-2 in. broad, the stipe about 2 in. long.

21. *A. GRANOSUS*, n. sp.—Pileus fleshy, convex, umbonate, furfuraceous.

ous-granulose, ochraceous; the disk rugose-plicate; the margin more or less undulate or irregular. Stipe somewhat bulbous, tapering upward, curved or crooked, stuffed, furfuraceous-scaly and ochraceous below the annulus, pallid or brownish above; the annulus reflexed, persistent. Lamellæ adnate, whitish. Spores subelliptic $.005 \times .003$ mm. (See Plate III.)

Gregarious or cæspitose, growing on or near rotten stumps and logs in woods. Pileus $2-3\frac{1}{2}$ in. in diameter, stipe 2-4 in. long, $\frac{1}{2}$ an inch thick at the base. Related to *A. amianthinus*, Scop., but a very much larger plant, and with a different mode of growth.

C. Pileus with a viscid cuticle.

22. *A. OBLITUS*, Peck.—Pileus fleshy, convex or expanded, somewhat umbonate, viscid, alutaceous or brownish. Stipe nearly equal, floccose, viscid; the annulus obsolete. Lamellæ free, whitish or yellowish. Spores $.004 \times .003$ mm.

In woods, common. Pileus 2-3 in. broad, stipe 2-3 in. long. This is readily recognized by its brownish, viscid pileus.

NOTE—*A. CLYPEOLARIUS*, Bull., of Lea's list, is omitted. I am disposed to think the *A. clypeolarius* of Fries' Icones has not yet been found in this country. The Lepiotas are very interesting plants, and I am aware that I have not here exhausted the list of those that grow in our valley; several of those given need more study and the measurement of the spores.

SUBGENUS III.—*ARMILLARIA*, Fr.

Spores white. Hymenophore confluent with the stipe. Veil partial annuliform.

23. *A. MELLEUS*, Fl. D.—Pileus fleshy, thin, explanate, scaly-pilose; the margin when expanded, striate, stipe spongy-stuffed; the annulus floccose, spreading. Lamellæ adnate, decurrent by a tooth, rather distant, pallid, at length somewhat reddish-spotted, mealy with the spores. Spores $.008-.009 \times .005-.006$ mm.

Very abundant in autumn in woods and fields about old stumps.

Pileus commonly 3-5 in. across, and stipe 4-6 in. high; though these measurements are exceeded. It occurs solitary, and is often densely cæspitose. The color is reddish or yellowish, the scales sometimes becoming brown; the stipe is firm, elastic and solid, more or less fibrillose. This is the only *Armillaria* as yet detected in the Miami valley.

SUBGENUS IV.—TRICHOLOMA, Fr.

Spores white (except in No. 27). Stipe fleshy, not corticate. Hymenophore confluent with the stipe, the lamellæ sinuate behind. All terrestrial.

a. Pileus white or whitish, 24, 25.

b. Pileus gray or violaceous, 26, 27.

c. Pileus brown or blackish, 28, 29.

a. *Pileus white or whitish.*

24. A. SPERMATICUS, Paul.—White. Pileus somewhat fleshy, convex, then explanate, obtuse, repand, glabrous, viscid. Stipe stuffed, then hollow, elongated, twisted, even. Lamellæ emarginate, rather distant, eroded. Spores .0056 mm. long.

In woods in autumn. Pileus about 3 in. in diameter, the stipe 3-4 in. long. The viscid pileus, shining when dry, and the twisted stipe often tapering at the base, distinguish the species. I find it rather scarce.

25. A. LATERARIUS, Peck.—Pileus convex or expanded, pruinose, whitish; the disk often tinged with red or brown; the thin margin marked with slight, subdistant, short, radiating ridges. Stipe nearly equal, solid, white. Lamellæ narrow, crowded, white, prolonged in little decurrent lines on the stem. Spores oval, .0046 mm. long.

Around old rotten logs in woods. Pileus 2-4 in. broad, stipe 3-4 in. high. The pinched up margin of the pileus is a convenient mark of specific distinction.

b. *Pileus gray or violaceous.*

26. A. TERREUS, Schæff.—Pileus fleshy, thin, soft, campanulate, then expanded, umbonate, clothed with innate floccose or scaly down, mouse-color. Stipe stuffed, nearly equal, appressed-fibrillose, whitish. Lamellæ attached, decurrent by a tooth, crenulate, white-gray. Spores somewhat elliptic, .0070×.0055 mm.

In woods, solitary. Pileus 2-3 in. broad, stipe about 3 in. high. Very scarce. The spores in my specimen are rather larger than in the British plant where they are given as nearly spherical and .0050 mm. long; yet the agreement is close otherwise.

27. A. PERSONATUS, Fr.—Pileus compact, then soft, convexo-plane, obtuse, regular, glabrous, moist. Stipe solid, obese, somewhat bulbous, villous. Lamellæ rotundate-free, close, violaceous then sordid. Spores pale salmon color, regular, .006×.003 mm.

In woods and thickets, September and October. Pileus 2-4 in. broad, stipe 1-3 in. long, $\frac{3}{4}$ in. thick. The whole plant in its prime is of a violet or lilac hue; this changes with age to a pallid or dirty white color. The pileus has an oily appearance on the surface, but is watery not viscid; the stipe is often very short and thick for the size of the pileus. The margin of the pileus is at first involute and villous-pruinose. The spores, although reddish, are regular in shape, and not angular as in *Entoloma*.

c. Pileus brown or blackish.

28. *A. CERINUS*, Pers.—Pileus fleshy, convexo-plane, obtuse or depressed, becoming glabrous. Stipe stuffed, fibrillose-striate, glabrous at the base, often brown. Lamellæ attached, seceding, close, yellow. Spores oval, $.0083 \times .0055$ mm.

In open woods about logs and rotten wood. Pileus $1\frac{1}{2}$ in. broad, stipe about $1\frac{1}{2}$ in. long. The plant I have so referred has the stipe brown-tomentose; in other respects it agrees quite perfectly.

29. *A. MELALEUCUS*, Pers.—Pileus fleshy, thin, convexo-plane, somewhat umbonate, glabrous, moist, growing pallid. Stipe stuffed, slender, elastic, rather glabrous, whitish with a few dark fibrils, thickened at the base. Lamellæ emarginate-attached, close, white. Spores unsymmetrical, apiculate, $.006 \times .004$ mm.

In woods in wet weather and on grassy grounds. Pileus $1\frac{1}{2}$ -3 in. broad, the stipe 2-3 in. long. The pileus varies in color from a sooty-black when fresh and wet to pale when dry; the lamellæ and stipe are white.

NOTE.—Our species of *Tricholoma* are remarkably few in number, and the individuals very scarce. Not a single species occurs in Lea's Catalogue. I am disposed to think I have had specimens of *A. schumacheri*, Fr., but they are not figured, and need verification. Being so few in number, I have given them an artificial arrangement, in order simply to facilitate their determination.

SUBGENUS V.—CLITOCYBE, Fr.

Spores white (except in No. 31). Stipe spongy-stuffed, somewhat elastic, externally fibrous. Margin of the pileus involute. Lamellæ attenuate behind, adnate or decurrent, never sinuate. Fungi mostly terrestrial.

A. Fungi solitary, pileus not infundibuliform.

a. Pileus not white, 30-32.

b. Pileus white, 33-37.

B. Fungi cæspitose, pileus more or less irregular, 38, 39.

C. Pileus infundibuliform, 40-42.

A. *Pileus convex then plane or depressed, regular; lamellæ adnate or regularly adnate-decurrent. Fungi solitary.*

a. *Pileus cinereous, purplish or brown, not white.*

30. A. NEBULARIS, Batsch.—Pileus fleshy, compact, convexo-explanate, obtuse, even, clouded with gray or dingy-brown. Stipe stuffed, firm, fibrillose-striate. Lamellæ somewhat decurrent, arcuate, close, white then pallid. Spores .0043×.0025 mm.

In woods, not common. Pileus 3-5 in. broad, stipe 3 in. long and about 1 in. thick. This is a large Clitocybe, with a stout stipe and a thick pileus. I have not yet found it myself; it is in Lea's Catalogue where it is stated as growing "amongst dead leaves in a fern ravine."

31. A. OCHRO-PURPUREUS, Berk.—Pileus subhemispheric, at length depressed, fleshy, compact, tough, pale alutaceous, slightly changing to purplish; the cuticle easily separable; the margin inflexed, at first tomentose. Stipe paler, here and there becoming purplish, tumid in the middle. Lamellæ thick, purple, broader behind, decurrent. Spores white or pale yellow.

In woodlands on clay soil. Pileus 2 in. across, stipe 2½ in. high; ¾ in. thick in the middle. This is one of Mr. Lea's new species, found first at Cincinnati, then at Waynesville. It has also been found in New York by Prof. Chas. H. Peck, the State botanist.

32. A. LACCATUS, Scop.—Pileus somewhat membranaceous, convex, then versiform, somewhat umbilicate, when mature, mealy or somewhat scaly, hygrophanous. Stipe stuffed, equal, tough, fibrous. Lamellæ adnate, thick, distant, brightly colored, at length white-pruinose.

In woods. Pileus 1-2 in. across, stipe 2-5 in. long. The pileus is usually reddish brown or ochraceous, sometimes of a brighter color. The lamellæ are commonly flesh-color or violaceous.

b. *The whole fungus white or whitish.*

33. A. CONNEXUS, Peck.—Pileus thin, convex or expanded, somewhat umbonate, minutely silky, white, sometimes faintly tinged with blue, especially at the margin. Stipe solid, nearly equal, whitish. Lamellæ crowded, narrow, whitish, decurrent. Spores somewhat ovoid, .007×.005 mm.

In woods. Pileus 2-3 in. broad, stipe 2-3 in. long. A very pretty species. I find it sometimes quite bluish on the pileus; and sometimes the stipe rather thicker than "tapering" at the base. The lamellæ sometimes appear a little rounded behind.

34. *A. PHYLLOPHILUS*, Fr.—White. Pileus fleshy, thin, rather plane, umbilicate, glabrous, growing pale. Stipe rather hollow, terete, then compressed, glabrous, white tomentose at the base. Lamellæ, adnate-decurrent, moderately distant, white then yellowish. Spores oblong-ovoid, $.0055 \times .0028$ mm.

In woods among old leaves, especially of beech. Pileus 2-3 in. broad, stipe 2-3 in. long. It sometimes occurs large and cæspitose, the pileus repand or even undulately lobed.

35. *A. CANDICANS*, Pers.—White. Pileus a little fleshy, convex then plane or depressed, even, out of a thin silky film becoming pure white, shining. Stipe disposed to be hollow, even, waxy, shining. Lamellæ adnate, close, thin, finally decurrent.

In moist places in woods among the leaves. Pileus about 1 in. across; stipe 1-2 in. high, incurved and villous at the base, the rest glabrous. The pileus usually preserves a very perfect and regular outline.

36. *A. DEALBATUS*, Sow.—White. Pileus a little fleshy, convex, then plane and revolute, even, glabrous, somewhat shining. Stipe stuffed, wholly fibrous, slender, equal, somewhat pruinose at the apex. Lamellæ adnate, close, thin, white.

In pastures and grassy grounds. Pileus about 1 in. across, sometimes orbicular, sometimes very wavy; stipe about 1 in. long, often curved. It has a mild, mealy odor.

37. *A. TRUNCICOLA*, Peck.—Pileus, thin, firm, expanded or slightly depressed, smooth, dry, white. Stipe equal, stuffed, smooth, often excentric and curved, whitish. Lamellæ narrow, crowded, adnate-decurrent. Spores oval, $.0048 \times .0037$ mm.

In woods, growing on fallen trunks and branches, especially of Maples. Pileus 1-2 in. broad, stipe about 1 in. high. This species, like *cyathiformis*, has a rather peculiar habitat for a *Clitocybe*.

B. Pileus more or less irregular; lamellæ unequally decurrent. Fungi cæspitose, often connate.

38. *A. ILLUDENS*, Schw.—Cæspitose, reddish-yellow. Pileus fleshy, glabrous, umbonate, convex, then expanded and depressed. Stipe very long, firm, solid, glabrous, tapering at the base. Lamellæ unequally decurrent.

In woods, growing in great masses about old stumps. Pileus commonly 4-6 in. broad, stipe 5-8 in. long, but these dimensions are sometimes much exceeded. This is a very showy and magnificent plant; it is a native of this country. It was first found in the woods of North Carolina, by Louis de Schweinitz; it occurs in New England, New York, Pennsylvania, and no doubt ranges westward to beyond the Mississippi. These great masses of bright saffron-yellow color attract the attention of the beholder at a great distance through the open woods. Passing its prime it begins to blacken.

39. *A. MONADELPHUS*, n. sp.—Densely cæspitose. Pileus fleshy, convex, then depressed, at first glabrous, then scaly, honey color, varying to pallid-brownish or reddish. Stipe elongated, solid, crooked, twisted, fibrous, tapering at the base, pallid-brownish or flesh-color. Lamellæ short, decurrent, not crowded, pallid flesh-color. Spores white, a little irregular $.0076 \times .0055$ mm. (See Plate IV.)

On the ground in wet woods from spring to late autumn. Pileus 1-3 in. in diameter, stipe 3-7 in. long. Symmetrical tufts of numerous (20-50) individuals spring up from a common point in the ground. In some of the tufts the pilei are of a beautiful bright honey-yellow color, in others they are a dull yellow, dull reddish or even brownish. The pileus is finally more or less scaly. This species does not appear to be closely related to any other Clitocybe; in color and general appearance it much resembles slender specimens of *Agaricus mellens*, but there is no ring.

C. Pileus infundibuliform; lamellæ equally decurrent.

40. *A. INFUNDIBULIFORMIS*, Schæff.—Pileus fleshy, compact, then soft, at first convex, umbonate, innate-silky, afterward infundibuliform, flaccid, expallent. Stipe spongy-stuffed, soft, elastic, thickened downwards. Lamellæ long-decurrent, a little close, pure white.

Among mosses and leaves in woods, common. Pileus 2-3 in. across. Stipe 2-3 in. high. The color of the pileus varies from pale reddish to alutaceous, and passing into white, but not at first white; it is sometimes variously crisped and lobed, the margin involute and downy, often pinched up into little raised striae.

41. *A. CYATHIFORMIS*, Bull.—Pileus fleshy-membranaceous, depressed then infundibuliform, even, nearly glabrous, moist, hygrophanous, margin for a long time involute. Stipe stuffed, elastic, tapering upward, fibrillose-reticulate. Lamellæ adnate then decurrent, distant, joined behind, sordid. Spores .008-.010×.005-.007 mm.

On the ground and on logs in woods. Pileus $1\frac{1}{2}$ - $2\frac{1}{2}$ in. across, stipe about 2 in. long. The color is at first brownish, then clay-color or alutaceous. The margin, when fully expanded, becomes striatulate. The stipe is colored as the pileus.

42. *A. PRUINOSUS*, Lasch.—Pileus fleshy-membranaceous, umbilicate, then infundibuliform, rather even, hygrophanous, sprinkled with a leaden bloom. Stipe stuffed, somewhat ascending, fibrillose, pallid. Lamellæ adnate then decurrent, close, narrow, white, then sordid.

On the ground and also on trunks, in woods, late in autumn. Pileus 1-2 in. broad, stipe 1-2 in. long. The pileus is brown, growing cinereous, sometimes scaly. This is one of Mr. Lea's finds that I have not yet met with.

SUBGENUS VI.—COLLYBIA, Fr.

Spores white. Pileus convexo-plane, the margin at first involute. Stipe hollow and cartilaginous, or medullate, with a cartilaginous bark, rooting. Lamellæ free or attached obtusely. Fungi epiphytal on wood, leaves, etc., or rooting in the ground.

A. Stipe glabrous.

a. Lamellæ broad, distant, 43, 44.

b. Lamellæ narrow, close, 45-48.

B. Stipe not glabrous.

c. Lamellæ broad, distant, 49-51.

d. Lamellæ narrow, close, 52-54.

A. Stipe glabrous.

a. Lamellæ broad, distant.

43. *A. RADICATUS*, Relh.—Pileus fleshy, thin, convexo-plane, gibbous, rugose, glutinous. Stipe stuffed, tall, tapering upward, rigid, glabrous, at length sulcate. Lamellæ attached, disposed to secede, distant, white. Spores, .017×.010 mm.

In woods and fields about the bases of old stumps; one of the commonest Agarics from early spring till late in autumn; always readily recognized by its long rooting stipe. Pileus usually 2-4 in. broad.

stipe 4-8 in. high, though these dimensions are sometimes greatly exceeded. The pileus varies much in color, being brownish, ochraceous, pallid and even whitish; it is at first slimy. The stipe is sometimes twisted, and in the variety which most commonly grows with us, the stipe is furfuraceous with minute scurfy particles.

44. A. PLATYPHYLLUS, Pers.—Pileus fleshy-membranaceous, explanate, obtuse, moist, fibrillose-virgate. Stipe stuffed, equal, soft, naked, striate, pallid; the root premorse. Lamellæ truncate-attached, distant, very broad, white. Spores, $.018 \times .013$ mm.

In woods, on and about rotten logs, common from spring to autumn. Pileus 4-7 in. across, stipe 3-5 in. high, and $\frac{1}{4}$ - $\frac{3}{4}$ in. thick. The pileus is watery, and varies in color from brownish and cinereous to whitish; it is sometimes quite wavy and irregular. The stipe is white, very stout and blunt at the base, with an abundant white mycelium. Ours may be the variety *repens* figured by Fries in his "Icones Selectæ;" I find the stipe sometimes hollow.

b. Lamellæ narrow, close.

45. A. BUTYRACEUS, Bull.—Pileus fleshy, convexo-expanded, umbonate, even, glabrous, moist, expallent, the flesh becoming white. Stipe somewhat stuffed, cartilaginous-corticate, conic, striate, dark reddish. Lamellæ nearly free, close, crenulate, white. Spores $.0076 \times .0050$ mm.

In woods, not common. Pileus 2-3 in. broad, stipe $2\frac{1}{2}$ - $3\frac{1}{2}$ in. high. The color of the pileus exceedingly changeable, normally reddish or brownish, then passing through ochraceous or alutaceous to pallid or whitish. The stipe often twisted and downy or villous at the thickened base. Our figure and specimens agree well with the figures of the species in Dr. Cooke's illustrations.

46. A. DRYOPHILUS, Bull.—Pileus somewhat fleshy, rather plane, obtuse, somewhat depressed, even, glabrous, expallent. Stipe hollow, glabrous, reddish or yellowish. Lamellæ sinuate-attached, nearly free, close, narrow, white or pallid. Spores .006 mm. in length.

Common in woods from early spring to autumn. Pileus 1-2 in. broad, stipe 2-3 in. high. Pileus commonly reddish-brown, sometimes paler, of a watery substance, and easily detached from the stipe. Stipe of the same color as the pileus, very smooth, often mycelio-enlarged at the base.

47. A. ESTENSIS, n. sp.—Pileus a little fleshy, conic-campanulate, then depressed or even revolute, yellowish, with a pallid margin. Stipe

equal, hollow, glabrous, pallid. Lamellæ narrow, crowded, nearly free, pallid, spores white, curved, .008 mm. long. (See Plate V.)

Growing among the fallen leaves in the woods from spring to autumn. Pileus 1-2 in. across, stipe 2-3 in. high. It is closely related to *A. dryophilus*; both are common in Este's woods, where the observer will readily distinguish them apart. The yellowish color of the pileus is seldom uniform; sometimes it is in streaks or patches, sometimes spread over the disk, leaving a pallid margin.

48. *A. COLOREUS*, Peck.—Pileus convex, then explanate and umbilicate, somewhat fibrillose, hygrophanous, yellow, sometimes tinged with red. Stipe hollow, glabrous, yellow, with a long crooked villous root. Lamellæ moderately close, emarginate, yellow. Spores .0083 mm. long.

Among decaying leaves and wood, solitary or subcæspitose. Pileus $\frac{1}{2}$ -1 in. broad, stipe 1-2 in. long without the root. The plant I have here described comes so near Prof. Peck's plant, that I have so referred it, although his description does not cover some of its marks. It resembles *A. cirrhatus* in size and general appearance, but maintains a uniform pale yellow color of stipe, pileus and lamellæ.

B. Stipe velvety, floccose or pruinose.

c. Lamellæ broad, distant.

49. *A. VELUTIPES*, Curt.—Pileus fleshy, thin, convexo-plane, obtuse, glabrous, viscid. Stipe stuffed, velvety, reddish-black, rooting. Lamellæ attached, distant, yellowish. Spores .006-.008 mm. long.

Common on and about stumps and trunks in woods, at the foot of posts, along fence rows, etc.; appearing late in autumn and persisting through the winter, new plants appearing with a mild spell of moist weather, until spring. Somewhat cæspitose, commonly ascending, sometimes excentric. Pileus 1-3 in. broad, slimy, and of a beautiful tawny color; stipe 2-5 in. long incurved, of a rich tawny brown, pale above.

50. *A. STIPITARIUS*, Fr.—Pileus a little fleshy, convexo-plane, umbilicate, velvety-scaly or brown-fibrillose. Stipe stuffed then hollow, tough, brown, hirsute-fibrillose. Lamellæ seceding free, ventricose, rather distant, white.

Upon sticks, roots of grasses, etc., gregarious. Pileus $\frac{1}{4}$ - $\frac{1}{2}$ an inch broad, the stipe 1-2 in. long. A very singular Agaric, with the habit of a *Marasmius*. Pileus whitish, clothed with tawny or brown hairs or fibres which sometimes form scales.

51. *A. ZONATUS*, Peck.—Pileus thin, fleshy, convex then expanded,

umbilicate, hairy-tomentose, tawny with obscure darker zones. Stipe equal, firm, hollow, tomentose-fibrillose, brownish-tawny. Lamellæ narrow, close, free, white. Spores somewhat elliptic, .005 mm. long.

In woods on old sticks on the ground. Pileus $\frac{1}{2}$ -1 in. broad, stipe $1\frac{1}{2}$ -2 in. long. Under a lens the pileus is seen to be clothed with coarse, densely matted, prostrate tawny or brown hairs. This curious plant is quite common in our woods in summer.

d. *Lamellæ narrow, close.*

52. A. LACHNOPHYLLUS, Berk.—Pileus somewhat fleshy, conic-hemispheric, brownish-tawny, velvety. Stipe hollow, brown-purple, shining, pallid above, somewhat velvety. Lamellæ free, velvety, with tawny pubescence.

On rotten pieces of wood, amongst dead leaves in woods, Waynesville. Somewhat cæspitose. Pileus $\frac{3}{4}$ in. across, stipe 2 in. high. I have not yet seen this exquisite species of Mr. Lea's.

53. A. HARIOLORUM, DC.—Pileus somewhat fleshy, campanulate, then hemispheric, plane or depressed, glabrous. Stipe hollow, tapering upward, reddish, woolly-hirsute. Lamellæ nearly free, rather close, narrow, white, growing pallid.

Among leaves, gregarious or somewhat cæspitose. Pileus $1\frac{1}{2}$ -3 in. broad, stipe 2-3 in. long. Pileus whitish or alutaceous.

54. A. CIRRHATUS, Schum.—Pileus somewhat fleshy, plane, finely silky, at length umbilicate. Stipe disposed to be hollow, flexuous, equal, pallid, pulverulent; the root twisted, fibrillose. Lamellæ adnate, close, narrow, white.

Among leaves, rubbish, etc. Small, tough, white inclining to reddish. Pileus $\frac{1}{2}$ an inch broad, stipe 1-2 in. long. The stipe generally has small yellowish tubers attached to it beneath the leaves or soil.

SUBGENUS VII.—MYCENA, Fr.

Spores white. Pileus campanulate, more or less striate; the margin at first straight and appressed to the stipe. Stipe tubular, cartilaginous, tapering upward. Lamellæ not decurrent, only uncinatè by a tooth. Fungi epiphytal or rooting.

A. Stipe without juice.

a. Pileus bright colored, 55, 56

b. Pileus dull colored, 57, 58.

B. Stipe with a colored juice, 59.

A. Stipe without juice.

a. Pileus bright colored.

55. *A. LEAIANUS*, Berk.—Cæspitose, viscid, bright orange. Pileus somewhat fleshy, convex; the margin striate. Stipe mostly curved, strigose at the base. Lamellæ distant, broad, emarginate-attached; the edge a darker orange or vermilion. Spores elliptic, apiculate, .0090×.0056 mm.

Growing in dense tufts on logs and branches in woods; very abundant throughout the year, from spring to autumn. Pileus about 1 in. across, stipe 1-3 in. long. The plant is very viscid, and stains the fingers that handle it. The bright orange color fades out as the plant grows old. This very beautiful Agaric was named for Mr. Thomas G. Lea, who was the first person to study the Fungi of the Miami Valley; his original notice of it is dated May, 1844. It grows in New York and New England.

56. *A. PURUS*, Pers.—Strong-scented. Pileus somewhat fleshy, campanulate expanded, obtusely umbonate, glabrous, expallent; the margin striate. Stipe rigid, even, nearly naked, villous at the base. Lamellæ broadly sinuate-attached, very broad, reticulate-connected, of a paler color than the pileus. Spores .008 mm. long.

In woods among the leaves. With a taste and odor of radishes. Pileus about 1 in. broad, stipe 2-3 in. high. Ours may be the *pseudopurus* of Cooke, but I have not seen the description, only the figure; the rather narrow lamellæ and longer spores seem to correspond with Cooke's figure. The plant exhibits considerable diversity of color, being rose-colored, lilac, lavender, pallid, and even white. It is commonly solitary or gregarious, scarcely cæspitose.

b. Pileus dull colored.

57. *A. GALERICULATUS*, Scop.—Pileus somewhat membranaceous, conic-campanulate then expanded, striate to the umbo, dry, glabrous. Stipe rigid, polished, even, glabrous; the base with a fusiform root. Lamellæ adnate, decurrent by a tooth, venose-connected, whitish or flesh-colored.

Common in woods upon stumps and fallen trunks. Often densely cæspitose, the stipes packed together at the base and strigose. Pileus $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, the stipe of variable length. The color whitish, cinereous, tawny, or brownish.

58. A. FILOPES, Bull.—Pileus membranaceous, obtusely, campanulate, expanded, striate. Stipe filiform, flaccid, rather fragile, glabrous; the base hairy, rooting. Lamellæ free, lanceolate, close, white.

In woods among the fallen leaves, simple and solitary. Pileus $\frac{1}{2}$ – $\frac{3}{4}$ in. broad, stipe nearly 2 in., besides the root. The color brownish or livid gray, rarely white.

B. *The plant when cut or broken exuding a colored juice.*

59. A. HÆMATOPUS, Pers.—Cæspitose. Pileus somewhat fleshy, campanulate, obtuse; the margin denticulate. Stipe rigid, white, pulverulent, when broken exuding a dark red juice. Lamellæ adnate, whitish.

Common in woods upon logs; recognized at once by the dark-red juice when broken. Pileus $\frac{1}{2}$ –1 in. in diameter, the stipe 2 in. or more. The color is commonly a dark reddish or purplish, sometimes paler. Our plant seems to be the same as the British plant described by B. & Br. in the Handbook, but neither seems to me to be the plant of Fries. The latter is *even*, the lamellæ of *one color*, etc. Fries' figure shows no striæ.

NOTE.—The Mycenæ like the Tricholomæ appear to be remarkably scarce in the Miami Valley. Yet being mostly very small plants, it is quite likely several species have been overlooked. *Leaianus*, *galericulatus* and *hæmatopus* are common enough, other species must be rare, and the individuals few in number.

SUBGENUS VIII.—OMPHALIA, Fr.

Spores white. Pileus somewhat membranaceous, more or less umbilicate. Stipe cartilaginous, usually thickened upward, and expanded into the pileus. Lamellæ truly decurrent.

A. Margin of the pileus at first inflexed.

a. Lamellæ narrow, close, 60–62.

b. Lamellæ broad, distant, 63–65.

B. Margin of the pileus straight.

c. Lamellæ broad, 66, 67.

d. Lamellæ narrow, 68.

A. *Pileus dilated from the first, the margin inflexed.*

a. *Lamellæ narrow, close.*

60. A. CHRYSÆUS, Peck.—Yellow. Pileus plane or somewhat depressed, umbilicate, striatulate, minutely scaly. Stipe nearly glabrous, stuffed or hollow, sometimes curved. Lamellæ close, rather narrow.

In woods. Pileus $\frac{1}{2}$ -1 in. broad, stipe 1-1 $\frac{1}{2}$ in. high. A beautiful little *Omphalia*, growing on leaves, I have here referred to this species. Some of my specimens are a little brownish on the pileus, with the lamellæ rather pale. It may prove to be something different.

61. *A. EPICHYSIUM*, Pers. Pileus membranaceous, rather plane, umbilicate; when wet, striate, cinereous-fuliginous; when dry, pallid, silky or flocculose-scaly. Stipe disposed to be hollow, glabrous, cinereous. Lamellæ briefly plano-decurrent, whitish-cinereous.

Growing on mouldy wood. Tender, soft, watery. Pileus $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, stipe an inch or more long. Sent by Mr. Meyncke, from Brookville, Ind.

62. *A. RUSTICUS*, Fr.—Pileus membranaceous, a little convex, umbilicate, striate, glabrous, hygrophanous, when dry, even, a little silky. Stipe somewhat stuffed, slender, glabrous, gray-brown. Lamellæ decurrent, thick, rather distant, gray; the edge arcuate. Spores somewhat elliptic, $.008 \times .005$ mm.

In moist places in woods. Pileus $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad, at first gray, then becoming whitish or brownish. The specimens agree well with Fries' species, except in some cases they are much larger.

b. Lamellæ broad, distant.

63. *A. MURALIS*, Sow.—Pileus somewhat membranaceous, tough, convex, umbilicate then infundibuliform, radiate-striate, glabrous, reddish-brown; the margin crenulate. Stipe stuffed, short, glabrous, concolorous. Lamellæ decurrent, distant, pallid.

In neglected spots upon the ground. Pileus $\frac{1}{2}$ -1 in. broad, stipe $\frac{1}{2}$ an inch high.

64. *A. UMBELLIFERUS*, Linn.—Pileus a little fleshy, convexo-plane; when wet, radiate-striate; when dry, even, somewhat silky. The margin at first inflexed, crenate. Stipe disposed to be hollow, short, pubescent at the base. Lamellæ decurrent, very distant, broadest behind. Spores $.0030 \times .0025$ mm.

Upon turf or sod in swamps and pastures, also on rotten wood; somewhat gregarious. Pileus $\frac{1}{2}$ -1 in. broad, stipe $\frac{1}{2}$ -1 in. high. Pileus depressed in the center, the margin deflexed and sometimes waved, whitish, whitish-brown or yellow, darker when wet; the stipe whitish or yellowish.

65. *A. ALBOFLAVUS*, n. sp.—Pileus fleshy-membranaceous, somewhat infundibuliform, even, glabrous, the margin inflexed. Stipe

stuffed, stout, thickened upward, white or yellowish. Lamellæ decurrent, very distant, arcuate, rather broad, thin, white then yellowish. Spores nearly globose, .004-.005 mm. long. (See Plate V.)

In woods on rotten wood in spring and summer. Pileus $1\frac{1}{2}$ -3 in. in diameter, stipe 1-2 in. long. The pileus is whitish and changes to yellowish as it passes maturity.

B. Pileus campanulate from the first, the margin straight and appressed to the stipe.

c. Lamellæ broad.

66. *A. CAMPANELLA*, Batsch.—Pileus membranaceous, convex, umbilicate, striate, hygrophanous. Stipe hollow, horny, clear brown; the base attenuate, tawny-strigose. Lamellæ decurrent, arcuate, venose-connected, luteous.

Upon trunks in woods; cæspitose, luteous-ferruginous. Pileus $\frac{1}{4}$ -1 in. across, stipe 1-2 in. long.

67. *A. FIBULA*, Bull.—Pileus membranaceous, cucullate then expanded, somewhat umbilicate, striate, expallent, even when dry, weak orange-color. Stipe setaceous, concolorous. Lamellæ long decurrent, distinct, whitish. Spores .003 \times .002 mm.

In moist places frequent among mosses. Pileus $\frac{1}{2}$ an inch or less in breadth, yellow or tawny with a dusky center; lamellæ yellowish or whitish; stipe 1-1 $\frac{1}{2}$ in. high, yellow or tawny with a brownish apex.

d. Lamellæ narrow.

68. *A. INTEGRILLUS*, Pers.—White, fragile. Pileus hemispheric then expanded, pellucid-striate. Stipe very slender, short, pubescent below. Lamellæ decurrent, fold-like, distant, somewhat branched; the edge acute. Spores .0125 mm. long.

Common on old rotten stumps; gregarious or cæspitose. Pileus thin, and membranaceous $\frac{1}{2}$ an inch or more broad, stipe $\frac{1}{2}$ -1 in. long. I have seen an old stump covered with them after abundant rains.

SUBGENUS IX.—PLEUROTUS.

Spores white. Stipe excentric, lateral or none. Fungi irregular, epiphytal.

A. Stipe excentric.

a. Lamellæ adnate, 69-72.

b. Lamellæ decurrent, 73-75.

B. Stipe lateral, 76.

C. Stipe none ; pileus sessile.

c. Pileus uniform, 77, 78.

d. Pileus gelatinous, 79, 80.

A. *Pileus entire, the stipe excentric.*

a. *Lamellæ sinuate or obtusely adnate.*

69. *A. ULMARIUS*, Bull.—Pileus fleshy, compact, convexo-plane, glabrous, somewhat spotted, moist. Stipe rather excentric, thickened downwards, somewhat tomentose. Lamellæ attached, rather close, broad, whitish. Spores nearly globose, .005 mm. long.

Upon trunks of trees, especially elm, frequent; in autumn. Pileus 3-7 in. broad, or sometimes larger, whitish or pale brownish, sometimes marbled with livid spots; stipe ascending, 2-3 in. long, about 1 in. thick, solid. Solitary or cæspitose.

70. *A. SUBPALMATUS*, Fr.—Cæspitose, reddish. Pileus fleshy, soft, convexo-plane, obtuse, wrinkled; the cuticle gelatinous. Stipe excentric, incurved, equal, fibrillose. Lamellæ adnate, close, joined behind. Spores minutely echinulate, nearly globose, .0056-.0070 mm. long.

On timber, old trunks, etc. This curious species was sent me from Brookville, Ind., by Mr. O. M. Meyncke; this appears to be the first locality in which it has been met with in this country. The specimens I have seen are 1½-2 in. wide, with a stipe ¾-1 in. long. The British plant measures 3-4 in. broad, with a stipe of 1-2 in.

71. *A. CRASPEDUS*, Fr.—Cæspitose. Pileus fleshy, more or less excentric, crenate and lobed, even, glabrous. Stipe solid, firm, elastic, glabrous, pallid. Lamellæ adnate, close, narrow, white. Spores nearly globose, .0056 mm. in diameter.

On trunks in woods. Pileus 3-5 in. broad, stipe 2-3 in. long. The whole plant is quite hard and tough; the pileus in my specimens, grayish or brownish, the margin much folded and lobed; the stipe rather thicker below. This seems to be the first record of it in North America.

72. *A. LIGNATILIS*, Fr.—Pileus fleshy, tough, convex then plane or umbilicate, irregular, at first flocculose-pruinose, afterward glabrous. Stipe stuffed then hollow, rather slender, irregular, somewhat villous. Lamellæ adnate, close, narrow, white. Spores .003-.004 mm. long.

On wood of beech and maple. Pileus 1-3 in. broad, stipe an inch or less in length. Commonly whitish, with a strong mealy odor.

b. *Lamellæ decurrent.*

73. A. CORTICATUS, Fr.—Pileus compact, entire, densely villous, at length floccose-scaly. Stipe firm, rooting, somewhat excentric, fibrillose; annulus membranaceous, lacerate. Lamellæ decurrent, rather distant, divided, white, anastomosing behind. Spores large, elliptic-oblong, $.011 \times .005$ mm.

On trunks in woods. Pileus in my specimens about 4 in. in diameter, the stipe 2-3 in. long. These specimens which were very few in number, may have been the variety *tephrotrichus*; the annulus was obsolete with the veil appendiculate around the margin of the pileus. The whole plant was clear white.

74. A. SAPIDUS, Kalch.—Cæspitose. Pileus fleshy, somewhat excentric, deformed, glabrous; the center depressed. Stipes solid, arising out of a common fleshy tubercle, glabrous, white. Lamellæ decurrent, rather distant, whitish. Spores with a lilac tinge, oblong, or a little curved and pointed, $.0083 \times .0037$ mm.

Very common on all sorts of fallen trunks and branches, from early spring till late in autumn, and even in the mild weather of winter. Pileus commonly 3-6 in. in diameter, the stipe 1-2 in. long or the pileus nearly sessile. The plant is various in form and color, being commonly white or clouded with brown; the flesh is always white. Clear white paper will disclose the lilac tint of the spores.

75. A. SALIGNUS, Abb. d. Schw.—Pileus fleshy, compact, spongy, somewhat dimidiate, horizontal, at first pulvinate, even, afterward the disk depressed, somewhat strigose. Stipe short, tomentose. Lamellæ decurrent, some of them branched, eroded, distinct at the base, nearly the same color as the pileus. Spores $.009 \times .0038$ mm.

“Upon trunks of willows late in autumn, solitary.”—*Fries*. Pileus convex, 4-6 in. broad, stipe excentric or lateral, sometimes obsolete; commonly fuliginous-cinereous, though sometimes ochraceous. Lea’s Catalogue is authority for this plant. “On a prostrate buckeye, Cincinnati, December.” It is strange that *sapidus*, so common as it is, is not in Lea’s Catalogue. Unless *salignus* shall yet be verified, we must conclude that Mr. Lea mistook *sapidus* for *salignus*.

B. *Pileus definitely lateral, not marginate behind.*

76. A. SEROTINUS, Schrad.—Pileus fleshy, compact, viscid. Stipe ex-

actly lateral, thick, scaly with sooty points. Lamellæ determinate, close, yellow or pallid. Spores oblong, $.005 \times .002$ mm.

Upon fallen trunks, common, late in autumn and in the winter. Pileus commonly 2-3 in. across, yellowish-green or olivaceous, the cuticle at first viscid, the margin slightly involute.

C. Pileus at first resupinate, the lamellæ concurrent to an excentric point, afterward the pileus reflexed, sessile.

c. Pileus uniform, the cuticle not gelatinous.

77. *A. PINSITUS*, Fr.—Whitish. Pileus fleshy, soft, at first resupinate, afterward expanded, horizontal, sessile, silky-villous, undulate, hygrophanous. Lamellæ broad, distinct. Spores of a sordid color.

"On trunks of trees, rare."—*Fries*. Said to resemble *A. mollis*, Schæff. Color of the pileus sordid when wet, pure white when dry.

78. *A. NIGER*, Schw.—Black. Pileus fleshy, tough, at first resupinate, then expanded, sessile, somewhat reniform, tomentose, glabrate toward the margin. Lamellæ thick, broad, close; the edge cinereous. Spores *white*, oblong, $.007 \times .004$ mm.

In woods on fallen branches. Pileus about $\frac{5}{8}$ ths of an inch wide, and $\frac{1}{2}$ an inch long. I find a black *Pleurotus* which I take to be Schweinitz's species; I do not have his description, and therefore submit the one given. It is a very interesting species; it seems singular that the spores should be white. It is quite tough and revives well after being dried.

d. Pileus with the cuticle viscid or gelatinous.

79. *A. MASTRUCATUS*, Fr.—Pileus fleshy, the upper stratum gelatinous, at first resupinate, afterward expanded, sessile, lobed, scaly, mouse-gray. Lamellæ broad, rather distant, whitish-gray. Spores oblong, oblique, $.008 \times .005$ mm.

Upon fallen trunks in woods. Imbricated; pileus 1-4 in. across, lobed in the larger specimens, flaccid, rough, with hairs and rigid points intermixed; some of the hairs or points are blackish. Evidently rare; I have found it but once.

80. *A. ALGIDUS*, Fr.—Pileus fleshy, at first resupinate, afterward expanded, reniform; the cuticle thin, viscid, glabrous, reddish brown. Lamellæ rather broad, close, yellowish.

On rotten wood. Pileus about 1 in. across, reddish umber or cinereous, usually caespitose and imbricated.

NOTE.—It is hoped the preceding pages will prove a fair introduction to the White-spored Agarics. This is the second effort, within the writer's knowledge, to introduce the student to a systematic knowledge of the Agaricini of any region of the U. S., the first being Prof. Chas. H. Peck's Agaricini of New York State, in the Twenty-third Report of the State Museum of Natural History. It is not to be expected that I have found all the species, yet I have increased the list from 34 in Lea's Catalogue to 80. Compared with the corresponding number in Mr. Frost's list of the fungi about Brattleboro, Vt., a region undoubtedly richer in this class of Fungi, there are in the latter 100 species of Leucospori. We will certainly make some additions, and I hold in reserve some figures which as yet appear to me to be new species. That I do not make some mistakes in the determination and identification of species, would be to accomplish something that has not yet been done in this country, even with flowering plants; but the greater part of these plants have been seen by me before in the Eastern States, and furthermore, specimens or figures of many of the remainder have been submitted to the most competent authority in this country, Prof. Chas. H. Peck, the State Botanist of New York.

These pages, and what may follow, are arranged according to the Hymenomycetes Europæi, of the illustrious Elias Fries, of Sweden; this arrangement accords also with the Handbook of British Fungi, by Dr. M. C. Cooke. It is designed to introduce the student, through the medium of our local flora, to a more extended knowledge of the Hymenomycetes of North America, by means of the works above mentioned, which are the most accessible to students. The specific descriptions of Fries, which are models of perspicuity and elegance, are translated with great care; such variations as may appear in our species along with other general observations on locality and time of growth, are made in appended remarks. The remaining Agarici will form the subject of a second paper.

A. P. M.

[TO BE CONTINUED.]

AMERICAN PALÆOZOIC BRYOZOA.

By E. O. ULRICH.

[Continued from Vol. 5, p. 257.]

AMPLEXOPORA ROBUSTA, n. sp. (Pl. I., figs. 1, 1a, 1b.)

Zoarium ramose, consisting of cylindrical, oftener of flattened branches, dividing dichotomously at rather frequent but irregular intervals, and usually varying in diameter from .4 inch to .7 inch. A very large specimen in my cabinet has a length of 4.3 inches; the central stem is flattened, and varies in diameter from 1.1 inches to 1.7 inches. The bases of two branches are on one side, and three on the other, the mean diameter of which is about .6 inch. Monticules are not developed. The cells are moderately thin-walled, polygonal, and consist of one kind only (*i.e.*, the interstitial cells are wanting); their arrangement is quite regular, and, when well preserved, show at their angles of junction the elevated points of the spiniform tubuli (Pl. I., fig. 1). At intervals of about .15 inch the surface exhibits conspicuous clusters of cells larger than the average, with a mean diameter of $\frac{1}{60}$ th of an inch. The smaller or ordinary cells have a diameter varying from $\frac{1}{100}$ th to $\frac{1}{90}$ th of an inch.

Tangential sections (Pl. I., fig. 1a) show that the cell-walls are comparatively thin and polygonal, and that their cavities are only occasionally rounded by a secondary deposit of sclerenchyma; and further that the original line of separation between adjoining cells is always more or less distinctly marked. The spiniform tubuli do not constitute a conspicuous feature in sections of this species, and unless carefully examined might be overlooked. With an occasional exception they always occupy the angles of junction of the cells. (Their appearance is very well represented by the figure.) Lastly, in many sections some of the cell-cavities inclose a small circular ring, that is due to the peculiar funnel-shaped diaphragms seen in longitudinal sections.

In longitudinal sections (Pl. I., fig. 1b) the tubes in the "immature" region are thin-walled, and crossed by straight diaphragms from two to four tube-diameters apart. The nearly equal curve of the tubes, from the axis of the branch to the peripheral portion, constitutes a characteristic feature of the species. As they enter the peripheral or "mature" region their walls are considerably thickened, and the diaphragms become much more numerous, being from less than one half to

one tube-diameter distant from each other. The funnel-shaped, diaphragms noticed in the preceding species (*A. cingulata*), are much more numerous in this species. Not infrequently two or three open into each other in such a manner that by the coalescence of the contracted parts of the superimposed funnels, a smaller irregular tube is formed within the proper tube-cavity. As is shown in fig. 1*b*, these diaphragms in their normal condition are represented in the section by two thin converging lines, springing from the walls of the tubes, and nearly meeting near the center of the tube cavity. Frequently, however, one of these lines is missing. In this case the diaphragm extends from one wall nearly across the tube toward the opposite wall.

Superficially, the species above described resembles the type of the genus, though not nearly enough to be confounded with it by one experienced in the determination of this group of fossils. The cell-walls are thinner, and the groups of large cells more conspicuous in *A. robusta* than in *A. cingulata*. Internally, the comparatively thin cell-walls and numerous funnel-shaped diaphragms, and the small number of spiniform tubuli of *A. robusta* will further distinguish it from that species. Care must be taken in separating the species from *Monotrypella æqualis*, Ulrich, which the smaller specimens of *A. robusta* strongly resemble. The former, however, is restricted to the lower 150 feet of the strata exposed at Cincinnati, O., while the latter is limited to a few feet of strata at least 225 feet higher in the series.

Formation and locality : Cincinnati Group. Rather rare near the tops of the hills about Cincinnati, O.

HETEROTRYPA, Nicholson.

Of the seventeen species placed under *Heterotrypa* by Nicholson ("The Genus Monticulipora" 1881), but two are, according to my opinion, congeneric, viz. : the type species, *H. frondosa*, D'Orb. (*H. mammulata*, Nich.), and *H. subpulchella*, Nich. Of the remaining fifteen, *H. andrewsi*, Nich., *H. nodulosa*, Nich., *H. sigillaroidea*, Nich., *H. ramosa*, D'Orb., and *H. dalei*, Ed. & H., must be referred to *Callopora*, Hall ; *H. barrandi*, Nich., and *H. moniliformis*, Nich., to *Amplexopora*, Ulrich ; *H. dawsoni*, Nich., to *Homotrypa*, Ulrich ; *H. girvanensis*, Nich., *H. implicata*, Nich., and *H. jamesi*, Nich., to *Batostoma*, Ulrich ; *H. gracilis*, Nich., and *H. tumida*, Phill., to *Batostomella*, Ulrich ; and *H. trentonensis*, Nich., to *Monotrypella*, Ulrich.

The type species of *Heterotrypa* is a common, easily recognized, and well known fossil of the Cincinnati group, and its characters have

been excellently described by Dr. Nicholson under the name of *H. mammulata*. As I have shown in the first part of my memoir, this is not the *Monticulipora mammulata*, of D'Orbigny, but his *M. frondosa*. *Heterotrypa subpulchella*, Nich., in its typical form, *i. e.*, flattened branches, is a rather rare species at a height of from 300 to 350 feet above low water mark in the Ohio river, on the hills surrounding Cincinnati, O. This is also about the range of the typical *H. frondosa*. Associated with them is a common intermediate form having a frondescent zoarium like the last species, from which, on the other hand, it differs in having distinct "maculæ," such as characterize *H. subpulchella*. Furthermore, in this intermediate form, the interstitial cells are not approximately restricted to the "maculæ," as is the case in *H. subpulchella*, but a greater or less number are distributed indiscriminately over the entire surface. The form under consideration clearly demonstrates the close relationship existing between *H. subpulchella* and *H. frondosa*, but, as a majority of its characters also pertain to the more typical examples of the latter, it should be regarded as a variety of that species. The Cincinnati group furnishes beside the two species mentioned in the preceding sentence, at least four and probably five other forms that are fully as distinct from *H. frondosa*, as is *H. subpulchella*. These, if I can command the space, I propose to describe in the next number of this publication. The two species next described (*H. vaupeli* and *H. solitaria*) show the extremes of the genus so far as observed. The first is a most peculiar and beautiful species, and has more interstitial tubes than any other species of the genus known to me. The latter is characterized by the almost total absence of interstitial cells, thus making a near approach to *Dekayia*, Ed. and H. In fact I have found it an exceedingly difficult matter to draw the line between *Heterotrypa* and *Dekayia*. Taking the types of the two genera, the differences are of course strongly marked. In *H. frondosa* we have a more or less broadly frondescent zoarium, the interstitial cells are quite numerous, and the spiniform tubuli are small, and sometimes very numerous. In *Dekayia aspera*, Ed. and H. (the type of the genus), the zoarium is irregularly branched, the branches subcylindrical or flattened, and the interstitial cells are very few or wanting, while the spiniform tubuli are few, but remarkably developed. Compare, however, such a species as *H. subpulchella* with a certain new species of *Dekayia*, differing in much the same manner from *D. aspera*, as *H. subpulchella* does from *H. frondosa*, and the generic differences are not so striking.

The species of *Dekayia* alluded to, has flattened branches and distinct maculæ of smaller cells, and the only well marked feature, shown in thin sections, wherein it differs from *H. subpulchella*, is found in the larger size and smaller number of the spiniform tubuli. Precisely the same difference distinguishes *H. solitaria* from another undescribed species of *Dekayia*. Despite the close resemblance between several species of the two genera, I believe that they should be held separate and distinct. I have been strengthened in this belief, after a careful examination of all the species of the two genera known to me, by finding a character that pertains in a more or less marked manner to all the species of *Dekayia*, but which I have sought for in vain in species of *Heterotrypa*: namely in species of *Dekayia*, at certain periods in the growth of the zoarium, a thin pellicle is drawn over greater or smaller patches of the surface, while other portions of the surface have the cell-apertures open. This covering being thin and delicate, is of course only to be observed in well preserved specimens. I have no doubt that the pellicle was developed at the close of the existence of the zooids of each layer of cells, so as to form the floor of the succeeding layers, and ultimately the diaphragms which cross the tubes.

As a summary of the preceding remarks, it may not be out of place to subjoin a description of *HETEROTRYPA*, based upon the aggregate of characters shown by the different species known to me.

Zoarium growing from an expanded base, attached to foreign objects, upward into simple, often undulated or irregularly inosculated fronds, and occasionally into flattened branches. Cell-apertures varying in shape from polygonal to circular. They are separated from each other by walls or interspaces, which may be comparatively thin (*H. solitaria*), or nearly as thick as their own diameter (*H. vaupeli*). Interstitial cells from few to very numerous, always angular or subangular. Spiniform tubuli small, usually numerous (sometimes excessively so, as in *H. vaupeli*), occasionally inflecting the walls, and giving the cell-apertures an irregularly petaloid appearance. Internally we find that the walls of the tubes are more or less thickened as they enter the "mature" region, and apparently amalgamated with one another. The diaphragms are straight, of one kind only, more numerous in the interstitial tubes than in the proper zoecia, and always more crowded in the "mature" regions than in the "immature" or axial region.

HETEROTRYPA VAUPELI, n. sp. (Pl. I., figs. 2, 2a, and 2b.)

Zoarium very irregular in its growth, forming twisted, and always more

or less inosculated loose masses, several inches in diameter, consisting of convoluted fronds, varying in thickness from .15 inch, to .3 inch. This irregularity of growth, which is very characteristic of the species, is caused by the frequent elevation of the face of a frond into a secondary frondescent growth, which eventually anastomoses with other similar divisions of the zoarium. The surface is sometimes nearly smooth, but usually is studded with small, rounded or conical monticules, the summits of which are subsolid, each being occupied by a small "macula" of interstitial cells. The arrangement of the monticules and maculae, in conformity with that of the cells, is very regular. Measuring from center to center, seven may be counted in the space of .5 inch. The cell-apertures are circular, and regularly arranged in decussating series, which are more or less curved around the monticules. One or two rows of cells immediately surrounding each of the small "maculae," are conspicuously larger than the ordinary cells, their *apertures* having a diameter varying from 1-150th to 1-100th of an inch, while the diameter of the cell-apertures in the interspaces is about 1-200th of an inch. Measuring along one of the series, twelve cells may be counted in the length of .1 inch. On an example of this species the cell-interspaces are comparatively thick, and may show, according to the stage of development and state of preservation, either all, or one or two, of three different appearances. In the first (probably due to attrition), the interspaces are smooth and apparently solid. In the second, they carry numerous small pits, representing the orifices of the interstitial cells. In the third (Pl. I., fig. 2), the apertures of the interstitial cells are obscured by an exceedingly large number of small spines or granules. The last phase doubtlessly represents the zoarium in its perfect and fully matured stage.

Tangential sections, according to the depth at which the zoarium is divided, may show one or both of two distinct phases. In the first (the one usually obtained on account of the unusual brevity of the "matured" portion of the tubes) the cells have moderately thin walls, are subangular or nearly circular, and in contact at limited points, the intervening spaces being occupied by smaller and angular interstitial cells. The spiniform tubuli, if any at all can be detected, are small and inconspicuous. In the second phase, which is obtained by cutting the cells of a fully matured specimen just below the surface, the interstitial cells appear to be almost entirely suppressed by the remarkably great development of spiniform tubuli, which are ranged in one or two closely crowded series around the cell cavities. Fig. 2a, Pl. I.,

represents a portion of a section somewhat intermediate between the two phases described.

Longitudinal sections (Pl. I., fig. 2*b*) show that the tubes in the axial region have very thin and somewhat flexuous walls; that they approach the surface gradually, that the peripheral or "mature" belt on each side of the frond is very narrow, and, as they enter the latter region, that their walls are thickened. In the proper zooecial tubes the diaphragms are usually wanting throughout the axial region, and they are never numerous even in the peripheral portion of the zoarium. In the interstitial tubes they are numerous, and generally very thick.

In its internal structure this species is very remarkable, and differs widely from *H. frondosa*. One peculiarity in its structure I can as yet not fully understand. That the interstitial cells are actually suppressed as the zoarium becomes fully matured, I must doubt. I would rather believe that the spiniform tubuli, which are developed in the spaces that in the earlier stages of the growth of the zoarium were occupied by interstitial cells, have sprung from the surface of diaphragms which covered the interstitial cells. I am upheld in this belief by finding, what appears to me to be, corroborative evidence: namely, on many diaphragms of the interstitial tubes, I can detect one or two, rather faintly delineated, hollow processes, extending upward from the diaphragm toward the one next succeeding. If this is not deceptive, then we have a curious analogy with such more recent Bryozoa as *Heteropora pelliculata*, Waters (a recent species), in which the orificed of the interstitial cells are closed by a *perforated* pellicle. The only difference (as regards this point) between such forms and *H. vaupeli*, being that in the latter the surface of the pellicle or diaphragm is elevated into a hollow spine, instead of being perforated by a simple foramen.

Examples of *H. vaupeli* are readily distinguished from all the frondescent *Monticuliporidae* described from the Cincinnati group, by their peculiar growth, circular cell-apertures, and regular arrangement of the cells and monticules. When in a good state of preservation the most striking characteristic is found in the granular cell interspaces.

The name is given in honor of my esteemed friend, Mr. E. H. Vaupel, who is an enthusiastic student of Palæozoic fossils. He has not only gathered one of the best collections of the Cincinnati group Bryozoa, but he is also able to classify them.

Formation and locality: Cincinnati group. Not uncommon near the tops of the hills about Cincinnati, O. It is associated with, and apparently restricted to the same beds as *Amplexopora robusta*. I

have one specimen of a nearly allied species or variety, which was collected near Waynesville, O., about 250 feet higher in the series.

HETEROTRYPA SOLITARIA, n. sp. (Pl. I., figs. 3, 3a, 3b.)

Zoarium consisting of thin undulated, or somewhat palmated expansions, from one to two tenths of an inch in thickness, and one inch or more in height. The surface is not raised into monticules, but at intervals of .15 inch, one may observe, on careful examination, small clusters of cells which are slightly larger than the average. The cells are polygonal and thin-walled, and those of the ordinary size have a diameter of about 1-100th of an inch, while that of the cells in the clusters mentioned, varies from 1-70th to 1-80th of an inch. The interstitial cells are almost entirely absent, and it is only rarely that I have been able to detect them at the surface. Occasionally the elevated points of small spiniform tubuli may be observed at the angles of the cells.

Tangential sections (Pl. I., fig. 3a) show that the cells are angular, and rather unequal, with moderately thin walls. The interstitial cells are very few in number, being almost entirely absent in some sections. The figure of a tangential section referred to at the beginning of this paragraph represents more of these small cells than is usual. The spiniform tubuli are small, but quite numerous, and generally developed only at the angles of junction of the cells. The walls of adjoining tubes appear to be amalgamated one with another, as no distinct line of demarcation can be detected between them.

Longitudinal sections (Pl. I., fig. 3b) show that the walls of the tubes in the axial region are very thin, and that diaphragms are not developed in this portion of the zoarium, these structures appearing only near the surface, where they are about one half a tube-diameter apart. The curvature of the tubes from the axial into the peripheral region is not abrupt but gradual. In the latter portion of the zoarium the tube-walls are but slightly thickened, and occasionally show one of the spiniform tubuli. The interstitial tubes, on account of their rarity, are easily overlooked. Those noticed were crossed by diaphragms, a little more crowded than in the larger tubes.

This species might be confounded with *Peronopora uniformis*, Ulrich, a species in which also the cell walls are thin, and the interstitial cells few in numbers. However, even without the potent aid of thin sections they can readily be distinguished by one character: namely, *P. uniformis* belongs to the *double-leaved* species, and, by

examining the edge of the zoarium, the tubes are seen to proceed at nearly a right angle from the distinct median laminæ to each face of the expansion. On the other hand, *H. solitaria* is truly *frondescens* (as explained on page 123, vol. V., of this Journal), and there being no median lamina in such forms, the margin of the frond is uniformly occupied by the cell-apertures. When longitudinally fractured, the tubes are seen to approach the surface in precisely the same manner, as they do in any of the ramose *Monticuliporidae*. The small, thin, and smooth frond, as well as the extreme paucity of interstitial tubes, will distinguish it from the species of *Heterotrypa* so far described.

Formation and locality: Cincinnati group. Rare near the tops of the hills west of Covington, Ky., at a height of about 300 feet above low water mark in the Ohio river.

(*DEKAYELLA* OBSCURA, n. gen. et. sp. (Pl. I., figs. 4, 4a, 4b.)

Gen. char., *ante* vol. V., p. 155.

Zoarium ramose, consisting of slender ramulets, .18 to .25 of an inch in diameter, dividing dichotomously at intervals of .4 inch or more. Monticules are not developed, the surface usually being smooth. Cells from 1-120th, to 1-110th of an inch in diameter, with moderately thick walls, and subangular apertures. When in a good state of preservation, the cell-orifices over large patches of the surface are entirely covered, or only partially, by a very thin pellicle or membrane. It is developed from the margin of the aperture inwardly, and when not fully completed, an irregular opening is left in the center (Pl. I., fig. 4). The boundary lines of the cells are now thin, and project but little above the pellicle. The interstitial cells are numerous, and vary much in shape and size, but are always more or less angular. At intervals of about .1 inch, they are usually aggregated into unequal clusters. The spiniform tubuli are of two kinds, large and small, the former may be observed very readily at the surface, and they often show the minute orifice at their summits. About five may be counted in the space of .1 inch. The latter are smaller and much more numerous, and can not be detected except on perfectly preserved examples. They are developed in the cell-walls, and three or four surround each cell.

In tangential sections (Pl. I., fig. 4a) the proper cells are subcircular, and have thick walls. Each cell-cavity is encircled by a thin band or ring of dark sclerenchyma, the thinner original walls having a lighter color. The interstitial cells are numerous, unequal and angular, those

constituting the clusters or "maculæ" being separated from each other by rather thin walls. The large spiniform tubuli are distinct enough, but the smaller ones can not always be detected. Especially is this the case in examples taken from a shaly matrix. In other specimens they are more apparent.

Longitudinal sections (Pl. I., fig. 4b) show that diaphragms, with an occasional exception, are entirely absent in the axial region, where the walls of the tubes are also very thin. The tubes approach the surface in a gradual curve, and as they enter the peripheral regions, their walls are thickened, sometimes becoming slightly beaded. Very thin straight diaphragms are developed crossing the tubes at distances apart of from one to one third tube diameter. The interstitial cells are divided by diaphragms, only a little more crowded than those in the proper zoecia. The large spiniform tubuli make their first appearance in the axial region, and in their course to the surface, they frequently cross obliquely over the tubes (see figure). The smaller ones are first developed in the "mature" or peripheral region, and can always be seen when the section passes through the face of a tube. The figure on Plate I. represents two tubes so divided.

In transverse sections the tubes in the central portion of the branch are slightly larger than nearer the margin. The walls are excessively thin, and polygonal, often nearly circular. Numerous smaller and more angular cells (young) occupy the interspaces left between them. The margin of the section cuts the tubes longitudinally, where they have the same appearance as in the peripheral regions of a vertical section.

Dekayella is probably more nearly allied to *Dekayia* than to any other genus of the *Monticuliporidae*. On the other hand the cell structure slightly resembles that of *Heterotrypa*. From the former the new genus is separated by having the tube-walls in the "mature" region of the zoarium thicker; in having numerous interstitial tubes, and instead of one, two distinct sets of spiniform tubuli. From *Heterotrypa*, *Dekayella* is distinguished by its ramose growth, and two sets of spiniform tubuli. The most peculiar character of the genus is found in the two sets of spiniform tubuli, differing from each other, both in the time of their development, and size. The larger set are precisely like those of *Dekayia*, and, as is likewise the case in that genus, they make their appearance already in the axial or "immature" region of the zoarium. This fact seems to point to a considerable difference in the functions of the two sets. The smaller spiniform tubuli are precisely

like those of *Heterotrypa*, *Amplexopora*, and other genera of the *Monticuliporidae*, in which these structures exist, and in none of these do they appear before the zoarium has become fully matured.

Dekayella obscura is readily distinguished from all the slender ramose Bryozoa of the Cincinnati group, by the thin membranaceous covering of the cell apertures. When worn its cellular structure resembles that of *Dekayella ulrichi* (*Heterotrypa ulrichi*, Nicholson), but the larger size of the zoarium of that species will always serve to distinguish them.

Formation and locality: Cincinnati group. Not uncommon at Cincinnati, O., at an elevation of 150 feet above low water mark in the Ohio river. The best locality known to me is on Brown street, where the base of the hill has been graded for building purposes.

CALLOPORELLA HARRISI, n. gen. et. sp. (Pl. I., figs. 5, 5a, 5b, 5c.)

Gen. char., ante vol. V., p. 154.

Zoarium discoidal, consisting of a concavo-convex, thin, circular expansion, different examples varying in diameter from .3 of an inch to 1.0 inch, and in thickness from .02 to .05 of an inch. The upper or convex side is smooth, and covered by the cell-apertures, while the lower concave side is lined with an epithecal membrane, which is marked with faint concentric wrinkles, and sometimes with obscure radiating striæ. The height of a specimen having a diameter of .8 of an inch, is about .25 inch. The cell-apertures are circular, and arranged in regular decussating series, the continuity of which is sometimes interrupted by groups of cells slightly larger than the average. These clusters occur at intervals of .15 inch, and the diameter of the apertures of the cells composing them, varies from 1-125th to 1-100th of an inch. They are further distinguished from the ordinary cells, the diameter of whose apertures is about 1-160th of an inch, by being separated from one another by interstitial spaces wider than usual. Measuring along one of the series, eleven or twelve of the ordinary cells may be counted in the space of .1 inch. The interstitial spaces in most specimens, under an ordinary hand glass, appear to be solid. But when well preserved, and viewed under a higher magnifying power, they are seen to be occupied by a single, occasionally a double row of angular depressions, representing the apertures of the numerous interstitial cells. (Pl. I., fig. 5.)

In tangential or transverse sections (Pl. I., fig. 5a) the proper zooecia are suboval or circular, and their visceral cavities are enclosed

by a ring-like wall composed of a dark, and concentrically laminated sclerenchyma. Their walls are sometimes in contact at limited points, but usually they are separated from each other by one or two rows of angular, and very thin-walled interstitial tubes. The presence of a few very small spiniform tubuli constitutes an inconspicuous feature of these sections.

Vertical sections (Pl. I., fig. 5*b*) show that the tubes immediately after their development, proceed upward for a short distance in an oblique direction, forming an angle of about 45° with the epithecal membrane. Soon after their walls become thickened, and their direction is altered so that they proceed at a right angle to the upper surface. The larger tubes in their lower part are crossed by straight diaphragms, one tube-diameter or less distant from each other. Further up they are remote and placed on a level in nearly all the tubes. The interstitial tubes are developed very near the epitheca, and are provided with numerous straight diaphragms.

At this time the species above described is the only one certainly known to belong to the genus *Calloporella*. There are, however, certain Upper Silurian species, which further investigations will probably prove to be congeneric. The transverse section of *C. harrisi*, reminds one considerably of *Fistulipora*, but I know of no species of that genus in which the walls of the proper zoecia are so thick. The surface characters of the zoarium, such as the cell-apertures and walls, are however clearly such as characterize the *Monticuliporidae*, and not the *Fistuliporidae*, the cell orifices in the latter being always surrounded by a more or less developed rim or lip. The affinities indicated by the surface characters are fully substantiated by vertical sections, which show that the interstitial spaces are crossed by straight and complete diaphragms, instead of being occupied by a vesicular structure, such as is characteristic of all the *Fistuliporidae*.

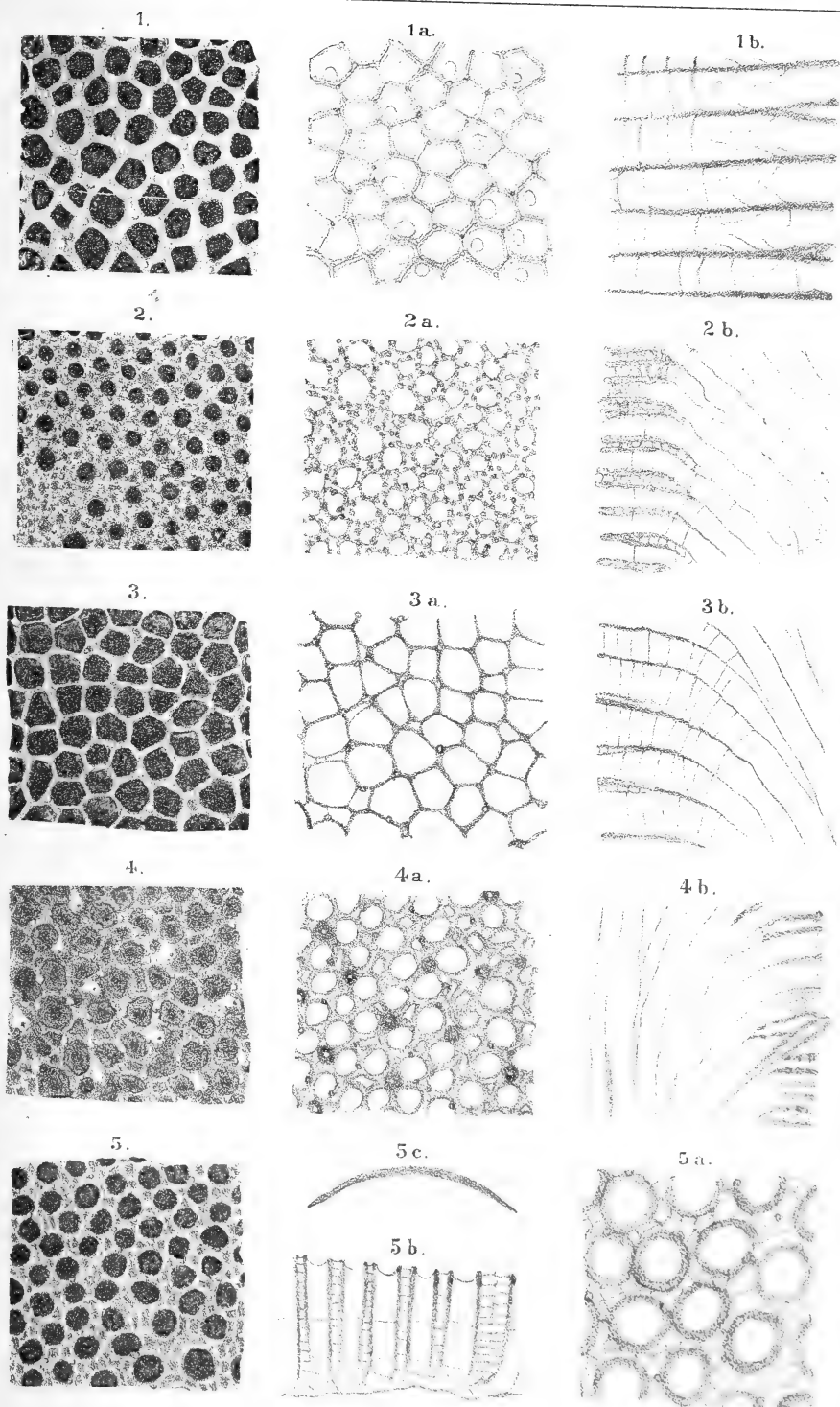
The Cincinnati group furnishes several species having a similar habit of growth, but they are all limited to the lower half of the group, while *C. harrisi* is found only in the upper part. In its internal structure it differs widely from them all.

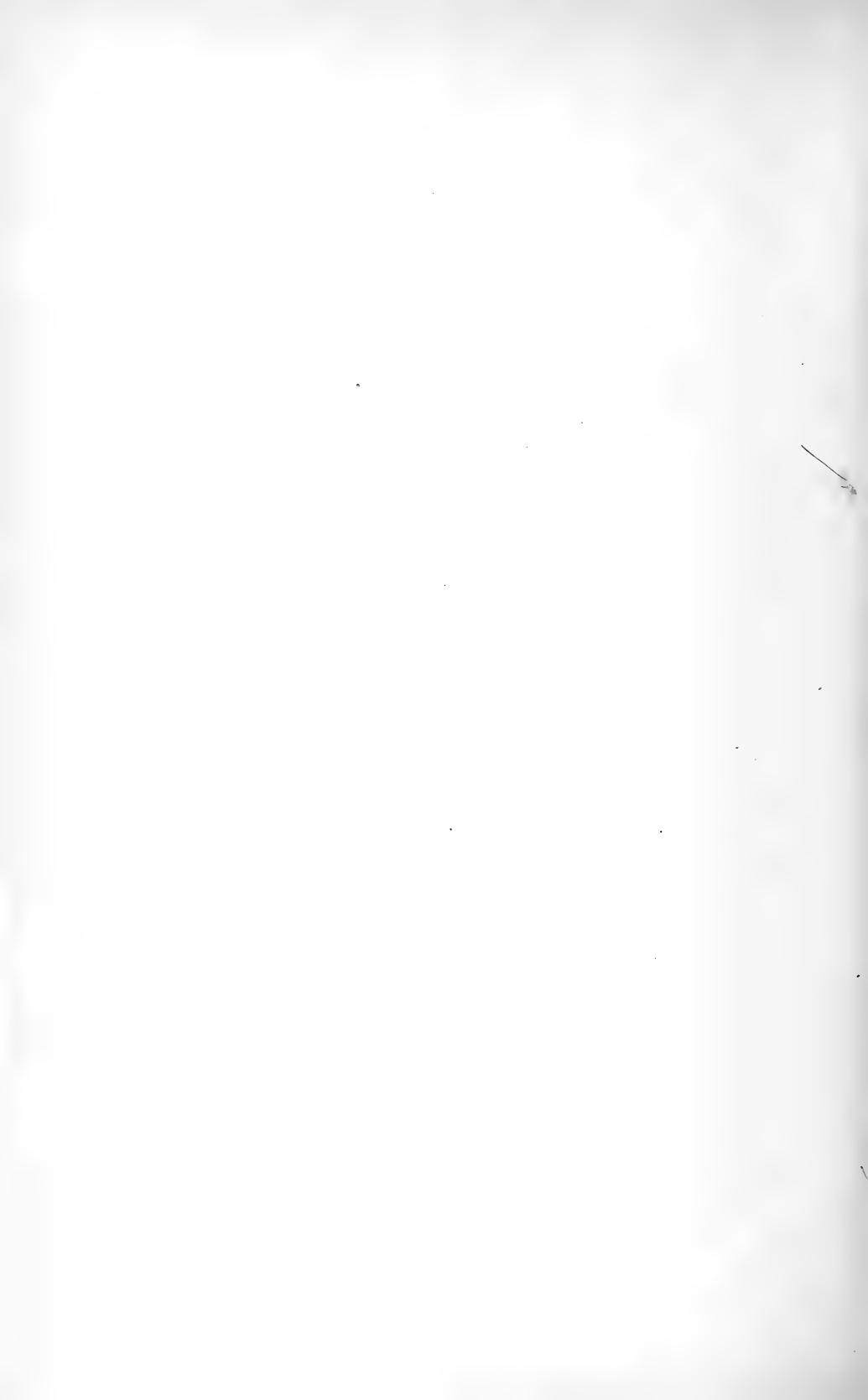
Formation and locality: Cincinnati group. Rather common in the upper part of the group at Oxford, Blanchester, Westborough, and other localities in southwestern Ohio.

[TO BE CONTINUED.]

PLATE I. ---

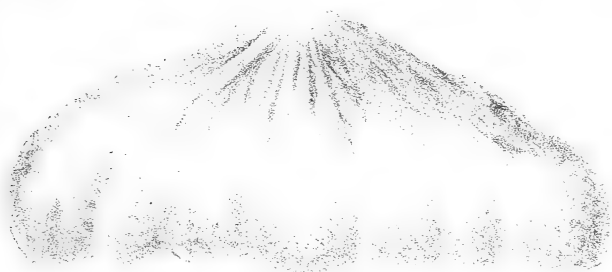
	Page.
Fig. 1. AMPLEXOPORA ROBUSTA, n. sp. The surface of a well-preserved example, 18 diameters,	82
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AGARICUS MORGANI, PECK.



.005 X .003 mm

AGARICUS GRANOSUS, MORG



.006 X .003 mm

AGARICUS MIAMENSIS, MORG.



.0076-.0083x.0056

AGARICUS MONADELPHUS, MORG.



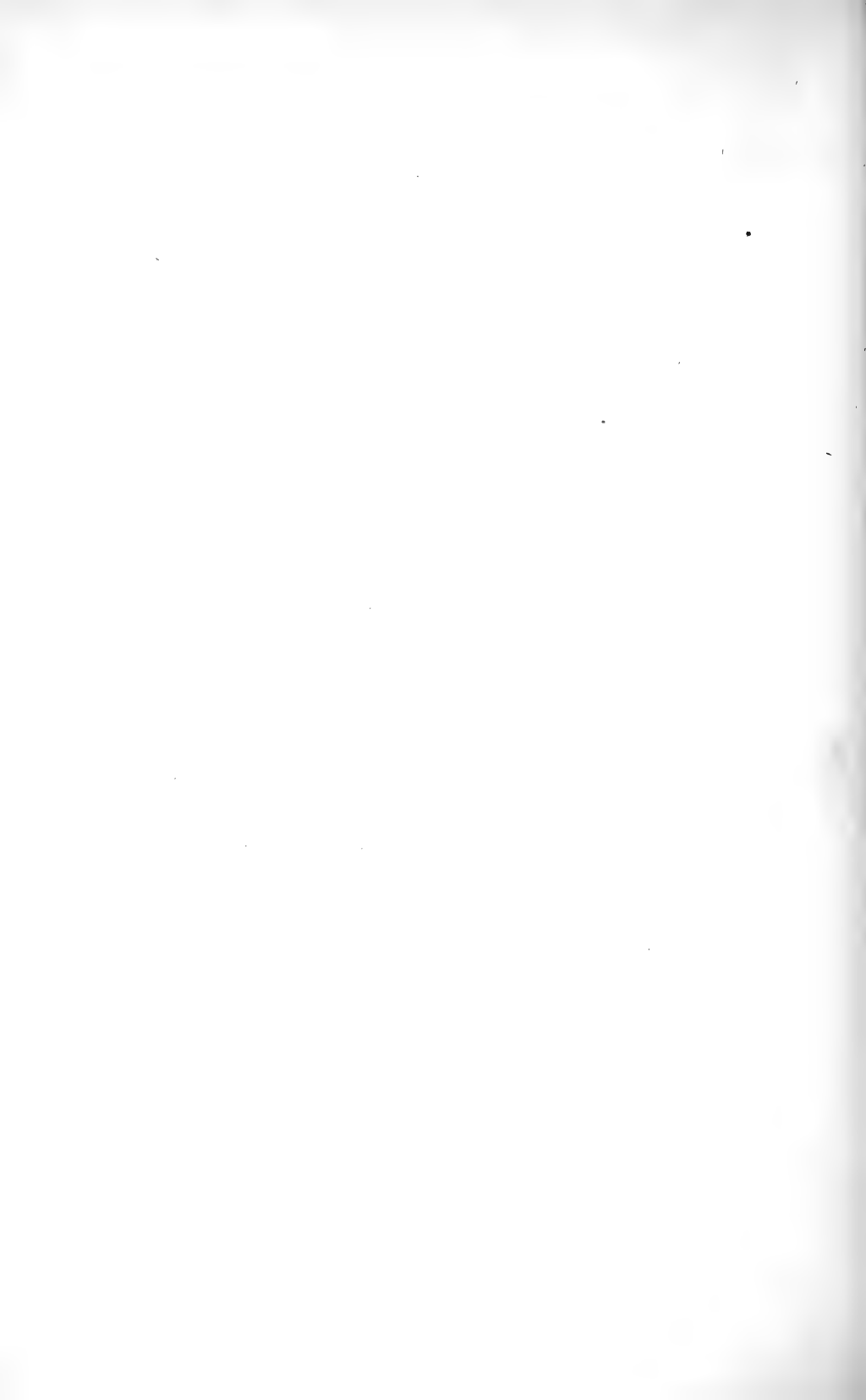
.008 x .005 mm

ARGARICUS ESTENSIS, MORG.



.004 - .005 mm

AGARICUS ALBOFLAVUS. MORG.



THE JOURNAL
OF THE
CINCINNATI SOCIETY OF NATURAL HISTORY.

VOL. VI.

CINCINNATI, JULY, 1883.

No. 2.

PROCEEDINGS OF THE SOCIETY.
ANNUAL MEETING.

TUESDAY EVENING, *April 3, 1883.*

Dr. R. M. Byrnes, President, in the chair. Present, twenty members.

Dr. E. T. Hurley, Leopold Burckhardt, Miss Nettie Fillmore, and Jacob S. Burnet, were elected regular members.

The report of the Treasurer was received, read and referred to a committee of audit, consisting of Prof. Geo. W. Harper, Prof. J. W. Hall, Jr., and Dr. A. E. Heighway, Sr.

The report showed that the funds of the society were in good condition, and with a cash balance in the treasury of \$1,063.01. The sum received from membership dues during the year was \$488.00, a larger amount than during any previous year in the history of the society. The number of members enrolled is 104, an increase of six since the last report.

Prof. J. W. Hall, Jr., curator of Mineralogy, reported that the collection of minerals is in good order, but needs cataloguing. There are about 2,000 labeled specimens; about 200 specimens have been added during the year.

Prof. J. Mickleborough, curator of Palæontology, said the collection now catalogued reaches 1819 numbers; 100 species have been added during the year. He suggested that authors of new species published and figured in the JOURNAL, be requested to deposit type specimens when possible.

Mr. E. M. Cooper, curator of Conchology, reported additions to the collection of 234 species of shells; of these, 59 were by donation, and 175 by exchange. The card catalogue reaches 1643 numbers, representing 1500 species, and probably 5000 specimens. This catalogue includes only Gastropoda, the Bivalves not being as yet arranged.

Dr. O. D. Norton, curator of Botany, reported additions to the Herbarium of 1026 species, by purchase and exchange, almost all entirely new to the collection, which now numbers about 3,300 species. Several valuable books have been received, among them a set of Darwin's Works, and Greville's Scottish Cryptogamic Flora.

Dr. A. J. Howe, curator of Comparative Anatomy, A. E. Heighway, Jr., curator of Herpetology, and Dr. D. S. Young, curator of Ichthyology, also submitted brief reports on the condition of the collections in their respective departments.

The custodian, Mr. J. F. James, read his report for the year, as follows:

"The reports of the condition of the collections in the various departments of the Museum having been prepared by the curators in charge, the custodian has little to report on his own account. During the year just ended he has been busy taking care of the collections as a whole, and putting in their places, as far as possible, the additions as they have been received.

"The museum has been visited by many more strangers during the past year than the previous one, and on the book kept to register the names of visitors there are about 1,205 names recorded. The schools have made good use of the collections also, and it is gratifying to state that the teachers of science in the public schools have shown interest enough in their pupils to come themselves with their classes and explain many things which otherwise would have been but little understood. This increasing use of the collections for study is another indication of the importance of the museum as an educational institution.

"The most important additions to the museum during the year have been the purchase of the collection of Dr. F. W. Langdon, consisting of some 1,140 specimens in the departments of Ornithology and Mammalogy, and the purchase from Mr. C. G. Pringle of a collection of 930 species of plants, chiefly from the Pacific Coast of United States. A number of exchanges have been made, but these are referred to under the various departments. The correspondence relative to the collections of the museum and the library has been attended to by the custodian, and 115 letters relating to these have been received and answered.

"Some new exchanges in the library have been secured during the year, and these are as follows: American Naturalist; Royal Academy of Sciences, Stockholm; Brooklyn Entomological Society; Edinburgh Geological Society; Linnean Society of New York; Nat. Hist. Society of Glasgow, Scotland; Papilio; Science Roll; and Torrey Botanical Club Bulletin.

"On the 10th of May, 1882, the members of the Society gave a Microscopical Soiree in the building. Some 100 guests were present, and the evening was passed in examining objects placed under the 12 or 14 microscopes on the tables. The success of this, the first attempt of the kind, induced the members to arrange for another reception. This was set for the 12th of February, but it was unavoidably postponed until the 23d of the same month. Invitations were issued, and between 100 and 125 responded. An address upon Mr. Darwin's life and work was delivered by Prof. A. G. Wetherby, and 14 microscopes with objects were on exhibition. These receptions have been very beneficial to the Society, inasmuch as they have attracted the attention of the citizens to our institution, and have been the means of adding a number of new members to the roll.

"Last October your custodian was sent to Paris, Kentucky, to investigate a mastodon which was reported to have been found there. The animal was found to be too much decayed to be preserved, but a number of fragments of bones were secured and have been placed in the collection. All of which is respectfully submitted.

JOS. F. JAMES, *Custodian.*"

The following persons were elected to serve as officers during the ensuing year:

President, J. H. Hunt, M. D.; First Vice President, Prof. J. Mickleborough; Second Vice-President, Prof. Geo. W. Harper; Secretary, Davis L. James;

Treasurer, S. E. Wright; Librarian, A. E. Heighway, Jr.; Members at large of the Executive Board, J. R. Skinner, Prof. A. P. Morgan, R. M. Byrnes, M.D., Prof. J. W. Hall, Jr.; Curators, Mineralogy, J. W. Hall, Jr.; Palæontology, J. Mickleborough; Conchology, E. M. Cooper; Entomology, Chas. Dury; Botany, O. D. Norton, M.D.; Ichthyology, D. S. Young, M.D.; Anthropology, L. M. Hosea; Comparative Anatomy, A. J. Howe, M.D.; Herpetology, A. E. Heighway, Jr.; Ornithology, W. H. Fisher.

A letter from Dr. L. G. deKoninck, of Liege, Belgium, accepting his election to corresponding membership was read.

The following donations were announced as received during the month: From Smithsonian Institution. Proceedings U. S. National Museum, 31-32; from Department of Interior, three pamphlets, viz., Higher School for Girls in Sweden, Maternal Schools in France, Technical Instruction in France; from Signal Service Bureau, Weather Review for January, 1883; from John M. Nickles, 4th, 5th, 6th, 7th and 8th Annual Reports of the Geological and Natural History Survey of Minnesota; from Prof. O. T. Mason, Washington, D.C., 3 pamphlets, Anthropological Notes for January, February, March, 1883; from John M. Nickles, Preliminary report, Building Stones of Minnesota; from Dr. D. S. Young, specimen of Shark mounted; from Dr. J. H. Hunt, 2 specimens *Polyporus applanatus*, 2 specimens *Dædalea ambigua*; from J. F. James, specimens of acorns; from C. F. Low, fragments of altar from mounds near Newtown, Ohio; from Messrs. Michie, jewelers, one eight day clock; from Dr. O. D. Norton, Catalogue Pacific Coast Fungi, by Harkness & Moore.

TUESDAY EVENING, May 1, 1883.

President Hunt in the chair. Present, twelve members.

The following papers were read by title: "On the Birds of Bardstown, Ky.," by Chas. W. Beckham; "Synopsis of the Genus *Clematis* in the United States," by Joseph F. James. The papers were referred to the publishing committee.

Prof. Wetherby made a verbal communication in regard to his new Genus *Enoploura*, which was published some time since in the Society's JOURNAL. He said that this genus had been severely criticised by Dr. Woodward, in the Geological Magazine, and that he had been refused a hearing by Dr. Woodward, who had not answered letters offering material for examination. Further study of specimens in his (Prof. Wetherby's) collection has confirmed the position taken that *Enoploura* is not a cystidean, but a crustacean, and that instead the genus dropping out of the lists, as had been remarked in a recent publication, it was, to his mind, more firmly established. These studies the professor hoped to lay before the Society ere long for publication.

Mr. W. J. Martin was proposed for regular membership, and Mr. Arthur F. Gray recommended by the executive board for corresponding membership.

Dr. Heighway, of the committee appointed to audit the treasurer's report, made a verbal statement that an examination of the accounts of the treasurer had been made, and they had been found correct.

The reports of the treasurer, curators and custodian, read at the annual meeting, were referred to the publishing committee.

The secretary announced that a reception would be given on May 23d, the 176th anniversary of the birthday of Carl von Linnæus.

Donations were announced as follows: From Smithsonian Institution, 5 signatures Proceedings of the U. S. National Museum, Nos. 33, 34, 35, 36, 37; 7 signatures Bulletin U. S. Fish Commission, Nos. 11, 12, 13, 14, 15, 16, 17; Classification of Coleoptera, by LeConte and Horn; from Dr. L. B. Welch, Wilmington, Ohio, 1 pamphlet; Description of Prehistoric Relics, 2 casts, viz., the Wilmington Tablet, and Welch Butterfly; from U. P. James, Paleontologist No. 7; from John Robinson, Cincinnati, skeleton of Emu (*Dromaius nova hollandiæ*); from Mrs. Robt. Bowler, Clifton, 1 Black Swan (*Cygnus*

atrata); from the Zoological Garden, Cincinnati, 1 Black Swan (skin); 1 ditto (mounted); 1 European Swan (*Cygnus oler*); 1 Great Kangaroo (*Macropus giganteus*); 1 Albino Raccoon (*Procyon lotor*); 1 Jaguar, S. Am. (*Felis onca*); 1 Chinese Silver Pheasant (*Euplocamus nycthemerus*); 1 Green Monkey (*Cercopithecus callitrichus*); 1 Rhesus Monkey (*Macacus erythraeus*); 1 Capuchin Monkey (*Cebus capuchinus*); from Signal Service Bureau, Washington, Signal Service Review, February, 1883; Report of Chief of Signal Service, 1872; from Chas. Dury, 2 skins, *Loxia curvirostrata* var. *americana*; from Boston Zoological Society, Quarterly Journal, Vol. ii., No. 2; from Davis L. James, Agricultural Report for 1866; from Joseph F. James, 4 specimens plants; from S. T. Carley, section of Sassafras wood; from Bureau of Education, Washington, Circular of Information No. 4, Planting Trees in School Grounds; from Wm. R. Lazenby, Columbus, O., 1st Annual Report of the Ohio Experimental Station; from Mrs. Dr. J. A. Henshall, Cynthiana, Ky., a collection of Shells, Algæ, Seeds, etc., from Florida and the West Indies; from Dr. N. P. Dandridge, collection from the Phosphate beds of South Carolina, two pamphlets, 1st and 2d reports of Commissioner of Agriculture of South Carolina, 1880-1881; from Dr. John A. Warder, 47 species Pine cones; from Dr. O. D. Norton, Japanese rain-cloak; from Dr. A. E. Heighway, 6 specimens of *Helix aspera*, 2 specimens of *Helix vermiculata*, from Italy, and 7 species of plants.

Reception on the Birthday of Linnæus, May 23, 1883.

By the authority of and under the direction of the Executive Board, invitations were issued on behalf of the society for a reception to be held on Wednesday evening, May 23d, in honor of Linnæus, who was born on this day, in 1707.

About one hundred persons assembled in the meeting room, which was tastefully decorated with ferns and flowers, kindly furnished by members of the society. Dr. J. H. Hunt presided, and with a few remarks introduced the speakers of the evening.

Mr. Davis L. James read a paper embodying the chief events in the life of Carl von Linné. Prof. A. P. Morgan sketched his chief work in Botany, and Prof. J. F. James read an entertaining notice of his Zoological labors. After the reading of the papers, an hour was spent in examining microscopic preparations in the board meeting room up stairs. The reception was more largely attended than any gathering during the history of the Society, and was a decided success.

TUESDAY EVENING, June 5, 1883.

Eight members present, not a quorum, and no meeting was held.

Donations were received during the month as follows: From the Department of Interior, Report of the Commissioner of Indian Affairs, 1882; from Dr. Zipperlen, Silver ore from Col., 3 specimens Obsidian, 6 specimens Lizards from California; from Prof. F. W. Putnam, Salem, Massachusetts, Notes on Copper Implements from Mexico; Bureau of Education; Answers to Inquiries about the U. S. Bureau of Education; from J. R. Skinner, Nicholson's Palæozoic Corals; from the U. S. Fish Commission, 7 signatures Bulletin, Nos. 18, 19, 20, 21, 22, 23, 24; from Entomological Society of Ontario, Canada, Report for 1882; Smithsonian Institution, 4 signatures, Proceedings U. S. National Museum, Nos. 38, 39, 40, 41; from Signal Service Bureau, Weather Review for March 1883; from Prof. Otis T. Mason, 8 pamphlets on Anthropology; from the Director of the U. S. Geological Survey, Vols. iii. and v., Contributions to North American Ethnology; from C. M. Ullery, specimen of *Samia cecropia*; from C. R. Mabley & Co., specimen *Samia cecropia*; from W. H. Knight, specimen of wood showing natural fracture; from J. F. James, Pumice stone from Colorado desert; from R. H. Stone, specimen *Samia cecropia*; from Canadian Bureau of Agriculture, through Dr. J. A. Warder, Rep. of the Fruit Growers' Association of Ontario.

THE MYCOLOGIC FLORA OF THE MIAMI VALLEY, O.

By A. P. MORGAN.

[Continued from p. 81.]

TABLE OF THE SUBGENERA OF HYPORHODII.

A. Stipe central, lamellæ free.

10. VOLVARIA.—Veil universal, discrete, membranaceous, persistent.

11. PLUTEUS.—Veil none, margin of the pileus straight.

B. Stipe central, lamellæ attached.

a. Stipe fleshy or fibrous.

12. ENTOLOMA.—Lamellæ sinuate.

13. CLITOPILUS.—Lamellæ decurrent.

b. Stipe cartilaginous.

14. LEPTONIA.—Pileus convexo-plane, the margin at first inflexed.

15. NOLANEA.—Pileus campanulate, the margin straight. (*No species yet.*)

SUBGENUS X.—VOLVARIA, Fr.

Spores rose-color. Veil universal, free persistent, discrete from the epidermis of the pileus (volva). Lamellæ rotundate-free, ventricose.

81. A. BOMBYCINUS, Schæff.—White. Pileus fleshy, soft, campanulate then expanded, somewhat umbonate, silky-fibrillose. Stipe solid, tapering upward, glabrous; the volva very ample. Lamellæ free, flesh-color. Spores regular, .007×.005 mm.

Upon trunks of trees in woods; sometimes growing out of knot-holes of *standing* trees, or even out of the augur holes in Sugar Maple. Pileus 3-5 in. broad, the stipe about 3 in. long. The pileus is at first inclosed in the large slimy tough volva, but is soon protruded leaving the volva persistent at the base of the stipe; it usually remains broadly campanulate, and is covered over with white or yellowish-white silky fibrils. This is one of the most showy Agarics, and is not uncommon in the Miami Valley.

SUBGENUS XI.—PLUTEUS, Fr.

Spores rosy. Destitute of volva and annulus. Lamellæ rotundate behind, free.

a. Pileus scaly or pruinose.

82. *A. CERVINUS*, Schæff.—Pileus fleshy, campanulate, then expanded, even, glabrous; the cuticle afterward seceding in fibrils or scales; the margin naked. Stipe solid, black-fibrillose. Lamellæ free, white, then flesh-color. Spores regular, .0058×.0046 mm.

On stumps and old logs in woods; one of the commonest Agarics throughout the year from early spring till winter. Pileus commonly about 3 in. in diameter, and stipe 3 in. long, though it varies considerably in size, as well as in color, and is often found much larger than these dimensions. Color sooty, smoky-gray, tawny-yellow and whitish, the stipe often white.

83. *A. GRANULARIS*, Peck.—Pileus convex, then expanded, somewhat umbonate, rugose-wrinkled, sprinkled with minute blackish granules, brown or brownish-yellow. Stipe solid, pallid or brown, velvety, with a short, close plush. Lamellæ free, close, ventricose, whitish then flesh-color. Spores nearly globose, about .005 mm. in diameter.

On old logs in woods, especially in damp ravines. Pileus $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, stipe 2-3 in. long. This is a very pretty species, not uncommon in our woods. I at first took it for the large form of *A. nanus*, Pers., though I could never find a white stipe; afterward I found that Prof. Peck had made a new species of it, as above. The granules form a sort of plush which is more dense on the disk of the pileus and on its wrinkles.

b. Pileus glabrous.

84. *A. LEONINUS*, Schæff.—Pileus somewhat membranaceous, campanulate then expanded, glabrous, naked, luteous; the margin striate. Stipe solid, glabrous, striate. Lamellæ free, yellow flesh-color. Spores regular, elliptic.

On decayed branches in woods. Pileus 1-3 in. broad, stipe 2-3 in. high. The pileus is tawny yellow, shaded with bright orange or purplish-brown; the stipe is downy at the base, tapering upward, twisted and striate, yellow or ochraceous shaded with orange.

85. *A. CHRYSOPHÆUS*, Schæff.—Pileus somewhat membranaceous, campanulate then expanded, even, naked, glabrous and virgate, cinnamon; the margin striate. Stipe disposed to be hollow, glabrous. Lamellæ free, white then flesh-color.

On trunks of beech and other wood; somewhat gregarious. Pileus 1-3 in. across, stipe 2-4 in. long. The color of the pileus yellowish or ochraceous-brown; the stipe whitish, mostly twisted.

SUBGENUS XII.—*ENTOLOMA*.

Spores rosy. Pileus somewhat fleshy, the margin incurved. Stipe fleshy or fibrous, soft. Lamellæ sinuate-attached behind or seceding.

a. Pileus umbonate.

86. *A. CLYPEATUS*, Linn.—Pileus slightly fleshy, campanulate then explanate, umbonate, glabrous, lurid, hygrophanous. Stipe floccose-stuffed, tapering upward, fibrillose, becoming pale. Lamellæ rotundate-attached, seceding, serrulate, dirty flesh-color. Spores irregular, angular.

In cultivated and waste places and in meadows. Pileus 3-5 in. across, stipe 3-4 in. high.

87. *A. STRICTIOR*, Peck.—Pileus thin, somewhat membranaceous, convex or expanded, umbonate, smooth, shining, hygrophanous; striatulate, grayish-brown. Stipe straight, equal, hollow, nearly glabrous, with a dense white mycelium at the base. Lamellæ rather broad, rounded or deeply emarginate, pale flesh-color. Spores irregular.

Ground in groves and on their borders. Pileus 1-2 in. diameter, stipe 2-4 in. long. The umbo is small, but distinct, the stipe is quite straight, and the aspect of the whole plant is beautifully regular and symmetrical.

b. Pileus not umbonate,

88 *A. RHODOPOLIUS*, Fr. Pileus slightly fleshy, campanulate-expanded, gibbous then somewhat depressed, hygrophanous; the margin flexuous, at first inflexed. Stipe hollow, nearly equal, glabrous, pure white, pruinose above. Lamellæ adnate then sinuate, white then rosy. Spores very irregular, angular.

In humid places in woods. Pileus 2-3 in. across, stipe 3-4 in. high. The younger pileus fibrillose, soon glabrous, when wet livid or brownish, the margin slightly striate, when dry tawny or paler and and silky-shining.

SUBGENUS XIII.—*CLITOPILUS*, Fr.

Spores rosy. Pileus with the margin at first involute. Stipe fleshy or fibrous. Lamellæ decurrent.

89. *A. ABORTIVUS*, B. & C.—Perfect, imperfect or altogether abortive.

Perfect form : Pileus fleshy, convex, then expanded and more or less irregular, gray or lilac in color. Stipe solid, nearly equal or

somewhat deformed, concolorous. Lamellæ arcuate and long-decurrent in some specimens, in others nearly plane and adnate-decurrent, at first grayish, at length bright flesh-color. Spores angular.

The imperfect and abortive forms present all stages of imperfection to a complete obliteration of all semblance of stipe and pileus when the fungus consists of a rounded more or less lobed mass.

In woods about old logs and stumps. Pileus 3 in. or more in breadth, stipe 2-3 in. long. The abortive forms sometimes cohere together in large masses. There is an odor of fresh meal, and a not unpleasant taste.

SUBGENUS XIV.—LEPTONIA, Fr.

Spores rosy. Pileus thin, umbilicate, or with the disk darker; the margin at first incurved. Stipe cartilaginous, tubular, polished, shining. Lamellæ at first attached or adnate, but easily seceding.

90. A. ASPRELLUS, Fr.—Pileus somewhat membranaceous, convex then explanate, sometimes glabrous, sometimes fibrillose, striate, the umbilicus villous and at length scaly, fuliginous, then livid gray. Stipe hollow, slender, even, glabrous. Lamellæ adnate, seceding, equally attenuate from the stipe to the margin, whitish-gray.

In pastures and grassy places. Pileus 1-1½ in. broad. Stipe 1-2 in. long. Stipe typically livid, but varies in color from brown to green and blue. Pileus at first dingy or mouse-color, soon plane and livid-gray.

Note.—Our *Hyporhodii* have not yet been looked for with sufficient care; three or four of the subgenera are yet wanting, which must have some representatives. I have had specimens of four or five other species, but so few in number, or so imperfect, that I am not yet able to assign them to any place. *Agaricus sapidus*, a common *Pleurotus*, with lilac-tinted spores, and *Panus dorsalis*, with red spores, are apt to be looked for in this series.

TABLE OF THE SUBGENERA OF DERMINI.

A. *Stipe central, fleshy or fibrous.*

a. *Stipe annulate.*

16. PHOLIOTA.—Lamellæ attached to the stipe.

b. *Stipe not annulate.*

a'. *Lamellæ sinuate-adnate.*

17. INOCYBE.—Pileus dry, scaly, fibrillose or silky.

18. *HEBELOMA*.—Pileus viscid, glabrous.

b'. Lamellæ adnate or decurrent.

19. *FLAMMULA*.—Pileus with the margin at first involute.

B. Stipe central, cartilaginous.

c. Lamellæ free.

20. *PLUTEOLUS*.—Pileus with the margin at first straight and appressed to the stipe.

d. Lamellæ attached.

c'. Lamellæ not decurrent.

21. *NAUCORIA*.—Pileus with the margin at first inflexed.

22. *GALERA*.—Pileus with the margin at first straight and appressed to the stipe.

d'. Lamellæ decurrent.

23. *TUBARIA*.—Pileus plane or depressed.

C. Stipe eccentric or none.

24. *CREPIDOTUS*.—Pileus eccentric, lateral or resupinate.

SUBGENUS XVI.—*PHOLIOTA*, Fr.

Veil partial, annulate. Lamellæ attached to the stipe.

A. Terrestrial, not caespitose, 91, 92.

B. Lignatile, caespitose.

a. Pileus scaly.

a'. Lamellæ at first whitish, 93-95.

b'. Lamellæ at first yellow, 96-98.

b. Pileus glabrous, 99, 101.

A. Terrestrial, rarely caespitose.

91. *A. DURUS*, Bolt.—Pileus rather compact, convexo-plane, glabrous, at length rimose-areolate; the margin even. Stipe stuffed, hard, externally fibrous, at the apex somewhat thickened and mealy; the annulus somewhat lacerate. Lamellæ adnate, ventricose, livid then brown-ferruginous. Spores ochraceous-brown, almost ferruginous, $.009 \times .006$ mm.

In gardens, hot houses, etc. Pileus 3 in. or more broad, the stipe short, about half an inch thick. Pileus pale tawny, or brownish tan.

92. *A. PRÆCOX*, Pers.—Pileus fleshy, soft, convexo-plane, becoming glabrous, even, pallid. Stipe medullate then hollow, cylindric, mealy-pubescent, afterward glabrous; the annulus white. Lamellæ rotundate-

attached, close, white changing to brown. Spores brown, sometimes inclined to be irregular in shape, $.008 \times .005$ mm.

Upon lawns, on grassy places along paths; sometimes very abundant after rains in spring, and the forepart of summer. Pileus $1\frac{1}{2}$ -3 in. in diameter, stipe 2-4 in. high. Pileus white or pale-tawny, sometimes yellowish; stipe somewhat flexuous, equal or tapering downward, white or shaded with buff; the annulus often dependent in fragments from the edge of the pileus.

B. Lignatile or epiphytal, generally cæspitose.

a. Pileus scaly, not hygrophanous.

a'. Lamellæ at first whitish.

93. *A. SQUARROSIDES*, Peck.—Pileus firm, convex, viscid when moist, at first densely covered by erect papillose or subspicose tawny scales. Stipe equal, firm, stuffed, rough with thick squarrose scales, white above the thick floccose annulus, pallid or tawny below. Lamellæ close emarginate, at first whitish, then pallid or dull cinnamon. Spores elliptic, ferruginous, $.005 \times .004$ mm.

Dead trunks and old stumps of maple in woods, in autumn. Densely cæspitose; pileus 2-4 in. broad, stipe 3-5 in. long. This species is closely related to *A. squarrosus*, with which it has no doubt been confused; but the latter is dry, not viscid, and is differently colored. I take this to be the *A. squarrosus* of Lea's Catalogue.

94. *A. LIMONELLUS*, Peck.—Pileus thin, convex or expanded, somewhat umbonate, viscid, rough with scattered erect reddish-brown scales, lemon-yellow. Stipe equal, solid, rough with revolute or recurved scales, pallid or yellowish; the annulus lacerate. Lamellæ narrow, close, rounded behind, whitish. Spores elliptic, ferruginous, $.006 \times .005$ mm.

Prostrate trunks of beech, in woods. Cæspitose; pileus 1-2 in. broad, stipe 2-3 in. long. This species is easily distinguished by its lively lemon-yellow color. The reddish-brown scales on the surface of the pileus finally become scattered and remote.

95. *A. ALBOCRENULATUS*, Peck.—Pileus fleshy, firm, convex or campanulate, somewhat umbonate, viscid, rough with dark-brown or blackish floccose scales, yellowish-brown. Stipe firm, nearly equal, stuffed or hollow, white above the evanescent annulus, scaly and pallid below. Lamellæ broad, rather distant, emarginate, the edge white-crenulate, grayish, then ferruginous. Spores somewhat elliptic, rather acute at each end, $.011 \times .006$ mm.

Growing out of the base of standing maple trees. Pileus 2-3 in. broad, stipe 3-5 in. long. This is a very marked species and rather rare, though it is liable not to be seen by reason of its habit of nestling between the roots of the maple. Under a lens the lamellæ appear to be beaded on the edge with milky globules.

b'. Lamellæ at first yellow.

96. *A. SPECTABILIS*, Fr.—Pileus compact, convexo-plane, dry; the cuticle torn into silky scales or fibres. Stipe solid, ventricose, somewhat rooting, mealy above the annulus. Lamellæ adnate-decurrent, close, narrow, yellow then ferruginous. Spores ferruginous, oblique, $.009 \times .006$ mm.

At the base of oak stumps. Somewhat cæspitose; pileus 3-5 in. broad; stipe 3-5 in. long, and 1 in. thick in the middle. Pileus thick, tawny or golden in color, then growing paler; flesh pale yellow, with here and there a tinge of sulphur. A large coarse species not uncommon in autumn, which does not appear to grow eastward.

97. *A. ADIPOSITUS*, Fr.—Pileus compact, convexo-plane, obtuse, luteous, glutinous, squarrose with superficial, seceding, concentric, darker scales. Stipe stuffed, somewhat bulbous, luteous and scaly as the pileus. Lamellæ adnate, broad, luteous then ferruginous. Spores ferruginous, $.007 \times .005$ mm.

At the base of trees, especially beech. Cæspitose, very large, shining when dry, white within; the scales thick, ferruginous. Pileus 3-5 in. broad, the stipe 3-5 in. long. This is a beautiful species growing in large tufts. Compared with the preceding, the pileus is very viscid, the stipe nearly equal, the flesh white within, and the lamellæ broad. Lea's Catalogue.

98. *A. TUBERCULOSUS*, Schæff.—Pileus, fleshy, convexo-plane, obtuse, dry; the cuticle broken up into innate, appressed, small scales. Stipe hollow, incurved, short, bulbous fibrillose; the annulus somewhat membranaceous, deciduous. Lamellæ emarginate, broad, serrulate, yellow, somewhat cinnamon. Spores bright ferruginous, elliptic, $.0083 \times .0056$ mm.

Growing out of solid timbers, little decayed. Rather solitary; the pileus 2-3 in. broad; the stipe 1-2 in. high, rather slender and somewhat bulbous where it starts from the wood. The pileus is quite thick, the flesh white; the lamellæ are very broad.

b. Pileus glabrous, hygrophaneous.

99. *A. MUTABILIS*, Schæff.—Pileus fleshy, convexo-explanate, glab

rous, expallent; the margin thin. Stipe stuffed then hollow, rigid, scaly-squarrose, ferruginous-blackish downward. Lamellæ adnate-decurrent, close, rather broad, pallid then cinnamon. Spores brown-ferruginous, $.011 \times .007$ mm.

Upon stumps and fallen trunks, rarely upon the ground. Cæspitose; pileus $1\frac{1}{2}$ - $2\frac{1}{2}$ in. in breadth, stipe 2-3 in. long, though the plant as its name indicates is quite variable in size and appearance. Pileus cinnamon, becoming pale when dry, commonly more or less umbonate and irregular. The stipe in my figures is rather smooth.

100. *A. MARGINATUS*, Batsch.—Pileus a little fleshy, convexo-expanded, glabrous, moist, hygrophanous; the margin striate. Stipe hollow, soft, not scaly, pruinose above the fugacious annulus; the base darker, white-velvety. Lamellæ adnate, close, narrow, watery cinnamon.

On ground and wood in a damp ravine; in spring. Pileus $1-1\frac{1}{2}$ in. across, stipe about 2 in. long. Of a watery substance; the veil often curtained; the stipe somewhat fibrillose or striatulate. Color watery-cinnamon, changing to alutaceous or whitish.

101. *A. UNICOLOR*, Fl. D.—Pileus a little fleshy, campanulate then convex, somewhat umbonate, glabrous, rather even, hygrophanous. Stipe stuffed then hollow, nearly glabrous, concolorous; the annulus thin, entire. Lamellæ adnate-seceding, broad, somewhat triangular, ochraceous-cinnamon. Spores ferruginous, oblong ovoid, $.0076 \times .0056$ mm.

On fallen trunks and branches in woods, especially along the damp ravines; in autumn. Cæspitose or solitary; pileus about 1 in. in diameter, stipe about 1 in. long. This little plant is very abundant; it is well marked by its regular shape, smooth surface and persistent annulus. The color is a brownish, ferruginous, drying to paler or ochraceous.

SUBGENUS XVII.—*INOCYBE*, Fr.

Pileus scaly, fibrillose or silky; the veil universal, concrete with the cuticle of the pileus. Stipe fleshy fibrous, not annulate. Lamellæ mostly sinuate. Spores more or less brown-ferruginous.

A. Stipe colored, scaly or fibrillose.

a. Stipe and pileus of the same color, 102, 103.

b. Stipe paler than the pileus, 104.

B. Stipe whitish, fibrillose.

c. Stipe solid, bulbous, 105.

d. Stipe equal, solid, 106, 107.

e. Stipe equal, hollow, 108.

C. Stipe whitish, glabrous, polished, 109.

A. *Stipe colored, scaly or fibrillose.*

a. *Stipe and pileus of the same color.*

102. A. LANUGINOSUS, Bull.—Pileus a little fleshy, hemispheric-expanded, obtuse, floccose-scaly, squarrose with erect muricate scales. Stipe solid, slender, scaly-fibrillose, white-pulverulent at the apex. Lamellæ seceding, ventricose, denticulate, pale-argillaceous.

Upon the earth in beech woods. Pileus about 1 in. broad, stipe 1½-2 in. high. Umber then yellowish, regular, scarcely odorous. Flesh dirty-white.

103 A. DULCAMARUS, A. & S.—Pileus a little fleshy, convexo-umbonate, pilose-scaly. Stipe disposed to be hollow, curtained-fibrillose and scaly, mealy at the apex. Lamellæ arcuate-attached, ventricose, pallid then olivaceous.

In woods, gregarious. Pileus olivaceous-brown, the flesh white changing to yellowish. I do not know this plant, and have no figure of it; it is given on the authority of Lea's Catalogue.

b. *Stipe paler than the pileus.*

104. A. PYRIDOROUS, Pers.—Pileus fleshy, conic-expanded, umbonate, clothed with appressed fibrous scales. Stipe solid, firm, equal, curtained fibrillose, growing pale, pruinose at the apex, reddish within. Lamellæ emarginate, rather distant, white-sordid then somewhat cinnamon.

Along roads and paths in woods, early. Pileus about 2 in. across, the stipe 2-3 in. high. "With a pleasant odor of pears or violets.—Fries. "Odor penetrating, like that of rotten pears."—Berkley. Pileus brown then becoming ochraceous-palid; the flesh reddish.

B. *Stipe whitish, slightly tinged with the color of the pileus, fibrillose.*

c. *Stipe solid, bulbous.*

105. A. RIMOSUS, Bull. Pileus fleshy, thin, campanulate, silky-fibrous, when expanded longitudinally rimose. Stipe solid firm, nearly glabrous, somewhat bulbous, white-mealy at the apex. Lamellæ free, somewhat ventricose, argillaceous changing to brownish. Spores elliptic-ovoid, .0083×.0056 mm.

In woods and waste places. Pileus 1-2 in. broad, stipe 1½-2½ in. long,

with an earthy odor. The bulb somewhat top-shaped, flattened above. Pileus commonly brown changing to yellowish; the flesh white.

d. Stipe equal, solid.

106. A. EUTHELES, B. & Br.—Pileus thin, campanulate, then expanded, silky-shining, somewhat scaly, cervine; the umbo fleshy, prominent. Stipe solid, nearly equal, fibrous, striate, pallid. Lamellæ adnate, pallid; the edge denticulate, white. Spores brown, even, cymbiform. .008 mm. in length.

On the ground in damp woods in autumn. Pileus 1-2 in. broad, stipe $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long. Odor rather disagreeable. This species differs from *rimosus* in the adnate lamellæ, and in the shape of the spores. My figures, however, are not strongly umbonate.

107. A. DISTRICUS, Fr.—Pileus fleshy, campanulate then explanate, umbonate, rimose, fibrillose, afterward lacerate-scaly, pallid, becoming reddish. Stipe solid, glabrous, fibrillose, striate, white changing to red. Lamellæ uncinat-adnate, close, whitish then gray-cinnamon.

Upon the earth in woods. Pileus about $1\frac{1}{2}$ in. broad, stipe 2 in. long. Flesh white; odor unpleasant.

e. Stipe equal, hollow.

108. A. AURICOMUS, Batsch.—Pileus a little fleshy, conic-campanulate, fibrillose, rimose-parted, yellowish; the margin striate. Stipe hollow, equal, undulate, fibrillose, white-pulverulent at the apex. Lamellæ attached, ventricose, whitish-brown.

Upon the ground in burnt places. Pileus much cracked. I have not seen this Agaric, and have no figure of it. Fries makes it a variety of *A. descissus*.

C. Stipe whitish, glabrous, polished.

109. A. GEOPHYLLUS, Sow.—Pileus somewhat fleshy, conic then expanded, umbonate, even, fibrillose-silky. Stipe stuffed, equal, rather firm, white, white-mealy at the apex. Lamellæ attached, close, white then sordid, at length earth-color. Spores argillaceous, somewhat oblique, .008 mm. long.

On the ground in woods. Pileus 1 in. broad, white, yellowish, etc. Stipe 1-3 in. long. Flesh white, odor unpleasant. My specimens are white, but it is said to vary much in color.

SUBGENUS XVIII.—HEBELOMA, Fr.

Pileus glabrous, more or less viscid; the margin at first incurved.

Stipe fleshy-fibrous, not annulate. Lamellæ sinuate-adnate. Spores mostly argillaceous.

110. *A. FASTIBILIS*, Fr.—Pileus compact, convexo-plane, repand, obtuse, viscid, glabrous. Stipe solid, firm, somewhat bulbous, white, fibrose-scaly. Lamellæ emarginate, rather distant, whitish then argillaceous-cinnamon. Spores elliptic, pointed, $.010 \times .0076$ mm.

In level woods in summer and autumn. Pileus 1-3 in. broad, stipe 2-4 in. high, and of variable thickness. Gregarious or solitary. Pileus reddish, yellowish, alutaceous or whitish. Lamellæ sometimes exuding watery drops. Odor and taste of radish.

111. *A. ILLICITUS*, Peck.—Pileus fleshy, firm, broadly convex or expanded, smooth, hygrophanous, very dark brown when moist, a little paler when dry. Stipe firm, equal, hollow, scabrous, distinctly striate at the top, paler than the pileus, with a white mycelium. Lamellæ close, broad, tapering outwardly, plane or ventricose, rounded behind, with a very slight decurrent tooth, pale dingy-brown. Spores somewhat elliptic, $.007 \times .005$ mm.

On rotten logs and sticks in woods in autumn. Pileus 1-1½ in. broad, stipe 1½-2 in. high. The habitat is unusual for species of this subgenus.

SUBGENUS XIX.—*FLAMMULA*, Fr.

Pileus fleshy; the margin at first involute. Stipe fleshy-fibrous. Lamellæ decurrent or adnate without a sinus.

112. *A. SAPINEUS*, Fr.—Pileus compact, convexo-plane, very obtuse, finely floccose-scaly, afterward rimose, golden-tawny. Stipe somewhat stuffed, deformed, thick, sulcate, rooting, yellowish. Lamellæ adnate, broad, golden, afterward tawny-cinnamon. Spores bright ferruginous, elliptic, $.008 \times .005$ mm.

Growing on wood; "on fence rails."—*Lea*. Pileus 1-4 in. broad; stipe commonly short, solid or hollow, often compressed, lacunose, etc. Flesh thick, soft, yellowish. Somewhat caespitose; the odor strong. Vestiges of the veil scarcely to be perceived.

113. *A. POLYCHROUS*, Berk.—Pileus convex then plane, broadly umbonate, of many colors, at first purple, viscid; the disk fleshy. Stipe firm, nearly equal, somewhat woody, at first furfuraceous. Lamellæ broad, rather distant, adnate, slightly decurrent, at first dirty white, then brownish-purple, at length yellow-brown.

On rotten trunks of trees, sticks, etc. Solitary or cæspitose; pileus 2-3 in. in diameter, stipe 1-1½ in. high; the veil fugitive consisting of purple and yellow flocci. The pileus when young is purple, it then changes to buff or light yellow on the margin, with the umbo purple or brownish-yellow. This very beautiful Agaric was first found by Mr. Lea, and named by his friend and correspondent, Rev. M. J. Berkeley, of England.

SUBGENUS XX.—PLUTEOLUS, Fr.

Pileus conic or campanulate, then expanded; the margin at first straight and appressed to the stipe. Stipe somewhat cartilaginous. Lamellæ rotundate-free.

114. *A. MUCIDOLENS*, Berk.—Scented. Pileus a little fleshy, lobed, glabrous, viscid, shining, sooty. Stipe fibrillose. Lamellæ free. Spores dull-ferruginous, somewhat cymbiform.

"On a rotten trunk. Cincinnati, April 21, 1842."—*Lea*. Pileus 2-3 in. broad, of a dull smoky brown; stipe 2 in. or more in height, clothed with brownish fibres. Smell like that of decayed cheese. This plant is one of Mr. Lea's new species. It is very interesting as being the only representative thus far known of this subgenus in North America.

SUBGENUS XXI.—NAUCORIA, Fr.

Pileus more or less fleshy, convexo-plane; the margin at first inflexed. Stipe cartilaginous. Lamellæ free or attached, but not decurrent.

115. *A. VERVACTI*, Fr.—Pileus fleshy, convexo-plane or umbonate, even, glabrous, viscid, shining when dry. Stipe stuffed then hollow, tapering upward, glabrous, rigid, whitish. Lamellæ adnate with a decurrent tooth, close, afterward ventricose, pallid then ferruginous-brown. Spores brown-ferruginous.

In meadows, pastures, etc. Pileus luteous, obtuse; stipe short, about 1 in. long, rather thick, tapering sometimes upward and sometimes downward. Flesh white.

116. *A. SEMIORBICULARIS*, Fr.—Pileus a little fleshy, hemispheric, expanded, even, glabrous, somewhat viscid, at length rivulose. Stipe slender, tough, almost straight, pale ferruginous, shining, with a free tubular pith. Lamellæ adnate, very broad, close, pallid then ferruginous. Spores brown-ferruginous, elliptic, very large, .013×.008 mm.

On lawns and in pastures and grassy grounds. Pileus 1-2 in. broad, stipe 3-4 in. long. Color when fresh tawny-ferruginous, when dry ochraceous.

SUBGENUS XXII.—GALERA, Fr.

Pileus more or less membranaceous, from conic or oval expanded, striate; the margin at first straight and appressed to the stipe. Stipe cartilaginous. Lamellæ not decurrent.

117 *A. TENER*, Schæff.—Pileus somewhat membranaceous, conic-campanulate, obtuse, hygrophanous. Stipe straight, fragile, somewhat shining, concolorous. Lamellæ adnate, close, ascending, linear, cinnamon. Spores somewhat ferruginous, elliptic, very large, .0137×.0076 mm.

In grassy grounds, upon manure, rotten wood, etc. Pileus $\frac{3}{4}$ -1 in. high and broad, stipe 3-5 in. long. Changing from a watery ferruginous or brownish when wet to ochraceous or pallid when dry.

118. *A. SILIGINEUS*, Fr.—Pileus membranaceous, globose-campanulate then expanded, unequal, even, not expallent. Stipe somewhat flexuous, equal, pallid, somewhat pruinose. Lamellæ adnate, broadly-linear, rather close, ochraceous.

Found with the preceding, commonly smaller. It can be separated from it by the stipe pallid, not straight, the base often attenuate, the pileus grayish, more convex, the margin often flexuous.

SUBGENUS XXIII.—TUBARIA, W. Smith.

Pileus somewhat membranaceous, often clothed with a universal floccose veil. Stipe cartilaginous, hollow. Lamellæ more or less decurrent.

119. *A. FURFURACEUS*, Pers.—Pileus a little fleshy, convex then plane, and at length umbilicate, hygrophanous, with a silky scaly veil, especially around the margin. Stipe hollow, flocculose, rigid, pallid. Lamellæ adnate-decurrent, rather distant, cinnamon. Spores ferruginous, .0056 mm. long.

Upon the ground, pieces of wood, piles of leaves. Pileus $\frac{1}{2}$ -1 in. broad, stipe 1-2 in. long. Pileus rich umber or cinnamon when moist, alutaceous-canescens when dry; stipe white-floccose at the base.

120. *A. INQUILINUS*, Fr.—Pileus somewhat membranaceous, convex then plane, glabrous, a little viscid, striate when wet, hygrophanous.

Stipe hollow, tough, tapering downward, dark brown, white-fibrillose. Lamellæ somewhat decurrent, rather distant, triangular, brown. Spores brown-ferruginous.

In woods on rotten wood, sticks and rubbish. Gregarious, very small; pileus $\frac{1}{2}$ an inch or less in breadth; stipe 1 in. long, scarcely a line in thickness.

SUBGENUS XXIV.—CREPIDOTUS, Fr.

Pileus eccentric, lateral or resupinate.

a. Pileus lateral.

121. *A. MOLLIS*, Schæff.—Pileus gelatinous-fleshy, soft, obovate or reniform, flaccid, nearly sessile, glabrous, pallid then canescent. Lamellæ decurrent to the base, close, linear, whitish then watery cinnamon. Spores ferruginous, elliptic, $.009 \times .0056$ mm.

On old stumps and rotten trunks; common. Solitary or imbricated; pileus 1-2 in. broad. Pileus, in the larger forms, undulately lobed, commonly sessile, but it varies, being sometimes produced behind into a short, strigose stipe.

122. *A. DORSALIS*, Peck.—Pileus fleshy, sessile, dimidiate or somewhat reniform, flat or a little depressed behind, with a decurved slightly striate margin, somewhat fibrillose-tomentose, distinctly tomentose at the point of attachment. reddish-yellow. Lamellæ close, ventricose, rounded behind, somewhat emarginate, converging to a whitish, villous, lateral space, pale ochraceous-brown. Spores ferruginous, globose, .006 mm. in diameter.

On old logs in woods. Pileus 1-2 in. broad. In general appearance, it bears some resemblance to *Panus dorsalis*.

123. *A. CROCOPHYLLUS*, Berk.—Pileus fleshy, convex, somewhat flabelliform, sessile, appressed scaly, ochraceous-brown. Lamellæ rather broad, rounded behind, bright buff or orange. Spores pale ochre-yellow, nearly globose.

On old logs in woods. Pileus scarce half an inch long. This is one of Mr. Lea's new species.

b. Pileus at first resupinate.

124. *A. VERSUTUS*, Peck.—Pileus at first resupinate, then reflexed, sessile, thin, pure white, soft-villous, the margin incurved. Lamellæ rather broad, somewhat distant, concurrent to an excentric point,

rounded behind, pale then ferruginous. Spores ferruginous-brown, somewhat elliptic, .010 mm. long.

In cavities of old stumps, on much decayed, half-buried wood, etc. Pileus less than 1 in. broad.

TABLE OF THE SUBGENERA OF PRATELLI.

A. *Stipe annulate.*

25. PSALLIOTA.—Lamellæ free from the stipe.

26. STROPHARIA —Lamellæ adnate.

B. *Stipe not annulate.*

27. HYPHOLOMA.—Veil woven into a web which adheres to the margin of the pileus.

28. PSILOCYBE.—Veil none.

SUBGENUS XXV.—PSALLIOTA, Fr.

Stipe annulate Lamellæ free.

a. *Annulus ample, not distant.*

125. A. ARVENSIS, Schæff. Pileus fleshy, conic-campanulate then explanate, at first floccose-mealy, afterward almost glabrous, even or rivulose. Stipe hollow, floccose-medullate; annulus pendulous, ample, consisting of two layers, the outer layer radiately divided. Lamellæ free, broader in front, reddish-white then brown. Spores elliptic, variable in size, averaging .010 X .006 mm.

In meadows and grassy grounds in fields. Pileus commonly 3-5 in. broad, and stipe 3-4 in. long, but these dimensions are often greatly exceeded. This is the "Horse Mushroom" of England; it is edible, but is not so delicate as *A. campestris*. The pileus and stipe are white, staining yellowish when bruised. The flesh remains white or takes on only a yellowish tint when cut or broken.

126. A. FABACEUS, Berk.—Pileus thin, somewhat fleshy, conical, umbonate, at length plane. Stipe bulbous, rather slender, nearly glabrous; veil ample, externally floccose. Lamellæ close, free, broader behind, brown then nearly black. Spores brown, nucleate on one side small, .0055 mm. long.

On the ground amongst the old leaves in woods; common. Pileus 3-4 in. across, stipe 3-4 in. high. The pileus is smooth, tough, feeling like fine kid leather, turning yellow when bruised; the stipe is bulbous

at the base, nearly equal above, rather slender and often gracefully curving. The lamellæ are at length almost black, like the dark part of a bean flower. This is one of the elegant new species of Lea's Catalogue.

b. Annulus small, remote.

127. *A. CAMPESTRIS*, Linn.—Pileus fleshy, convexo-plane, floccose-silky or scaly. Stipe stuffed, even, white; the annulus in the middle, somewhat lacerate. Lamellæ free, approximate, ventricose, somewhat liquescent, fleshy-brown. Spores brown, nearly elliptic, .008×.006 mm.

In rich soil of old pastures; some years abundant. Pileus commonly 2-3 in. broad, stipe $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long. This is the "Common Mushroom," which from the most ancient times has been highly esteemed for food; out of it numerous cultivated varieties have arisen. It has a faint odor and a pleasant taste; the flesh is firm, thick, white changing more or less to a reddish hue when cut or broken. It is the small, round, undeveloped plants that are eaten.

128. *A. SILVATICUS*, Schæff.—Pileus fleshy, thin, campanulate then expanded, gibbous, fibrillose and scaly. Stipe hollow, equal, whitish; the annulus simple, distant. Lamellæ free, close, equally attenuate both ways, thin, dry, reddish changing to brown. Spores elliptic, .0064×.0043 mm.

In woods. Pileus about 3 in. broad, stipe 3-4 in. long. The pileus is a great deal thinner than in the preceding species, more fragile, darker, it is at first covered with brown scales which at length scale off, leaving at least the disk smooth; the margin is often rimosely incised. The flesh is white changing a little to reddish.

SUBGENUS XXVI.—STROPHARIA, Fr.

Stipe annulate. Lamellæ more or less adnate.

a. Growing on wood or on the ground.

129. *A. ÆRUGINOSUS*, Curt.—Pileus fleshy, convexo-plane, somewhat umbonate, covered with a bluish-green seceding slime, expallent. Stipe hollow, equal, viscid, beneath the annulus scaly or fibrillose, tinged with blue. Lamellæ adnate, soft, brown changing to purple. Spores elliptic, purplish .007×.005 mm.

Upon the earth and upon trunks of trees in woods. Pileus 1-4 in. broad, stipe 2-3 in. high. Gregarious; pileus dull yellow but covered with a bluish gluten; above this, but not always, clothed with white scales; stipe with various tints of blue, green or yellow, within mottled

with blue, the center white; annulus generally fugacious; smell disagreeable.

b. Growing on manure.

130. *A. STERCORARIUS*, Fr.—Pileus a little fleshy, hemispheric then expanded, even, glabrous, discoid, somewhat viscid. Stipe stuffed with a discrete pith, elongated, flocculose beneath the distant annulus, even, somewhat viscid. Lamellæ adnate, broad, white then umber and olive-black. Spores purple-brown, elliptic, very large, $.017 \times .013$ mm.

In woods and pastures, on manure. Pileus $1-1\frac{1}{2}$ in. broad, stipe 3-4 in. high. Pileus luteous, livid-yellowish, etc.; stipe yellowish. Lamellæ broadest behind, truncate and somewhat decurrent. Distinguished from *A. semiglobatus* by the distinct medullary substance by which the stipe is stuffed, and by the pileus finally becoming expanded.

131. *A. SEMIGLOBATUS*, Batsch.—Pileus a little fleshy, hemispheric, even, yellowish, glutinous. Stipe hollow, slender, straight, glabrous, yellowish, glutinous; the veil inferior, with an abrupt annular termination. Lamellæ adnate, broad, plane, clouded with black. Spores purple-brown, elliptic, large, $.014 \times .009$ mm.

Common on manure or manured soil. Pileus $\frac{1}{2}$ -1 in. in diameter, stipe 2-3 in. high. The pileus is viscid when moist, shining and smooth when dry; the stipe is hollow, at first very viscid, shining when dry, with a closely glued silkiness; the annulus is more or less perfect and deflexed, the lamellæ are very broad, mottled with the purple-brown spores, with at length a cinereous, sometimes a yellow tinge.

SUBGENUS XXVII.—HYPHOLOMA.

Pileus more or less fleshy, the margin at first incurved; the veil woven into a web, which adheres to the margin of the pileus. Lamellæ adnate or sinuate.

A. Pileus not hygrophanus.

a. Pileus glabrous, bright-colored, 132, 133.

b. Pileus scaly or fibrillose, 134-136.

B. Pileus glabrous, hygrophanus, 137, 138.

A. Pileus not hygrophanus.

a. Pileus glabrous, bright-colored when dry.

132. *A. SUBLATERITIUS*, Schæff.—Pileus fleshy, convexo-plane, obtuse, discoid, dry, becoming glabrous; the flesh compact, whitish. Stipe stuffed, fibrillose, tapering downward, ferruginous. Lamellæ adnate, close, white then dingy-olive. Spores elliptic, brown-purple, $.005 \times .0035$ mm.

On and about old stumps; very common late in autumn and at the beginning of winter. Pileus 2-4 in. broad, stipe 3-5 in. long. Gregarious and caespitose; pileus brick-red or tawny on the disk, paler toward the margin, silky when young, but becoming glabrous; taste bitter and nauseous.

133. *A. FASCICULARIS*, Huds.—Pileus fleshy, thin, somewhat umbonate, glabrous. Stipe hollow, slender, fibrillose, flexuous, yellow; the flesh yellow. Lamellæ adnate, crowded, linear, somewhat liquescent, sulphur then greenish. Spores elliptic, ferruginous-purple, $.006 \times .004$ mm.

On stumps and old logs and on the ground. Gregarious and densely caespitose; pileus about 2 in. in breadth, the stipe 2-5 in. or more in length. Pileus at first conic, then expanded, more or less irregular from the tufted mode of growth, tawny, yellow toward the margin; stipe long, curved and unequal, yellow-greenish above; taste bitter and nauseous.

b. Pileus scaly or fibrillose.

134. *A. LACRYMABUNDUS*, Fr.—Pileus fleshy, convex, obtuse, pilose scaly; the scales innate and darker; the flesh whitish. Stipe hollow, fibrillose-scaly, whitish. Lamellæ adnate, close, brown-purple. Spores brown-purple, oblique $.0076 \times .0056$ mm.

Upon the ground and rotten trunks in woods. Commonly caespitose; pileus 2-4 in. broad, stipe 2-4 in. high. Pileus at first campanulate, at length expanded, pale reddish-brown, darker in the center; flesh pale umber; lamellæ at first pale, then reddish-brown; stipe pale, umber toward the base, whitish above, somewhat thickened below, rather flexuous, pale umber within; odor disagreeable.

135. *A. PYROTRICHUS*, Holmsk.—Pileus somewhat fleshy, conic then hemispheric, obtuse, densely clothed with tawny fibrils, reddish-tawny; the flesh and curtain tawny. Stipe hollow, fibrillose, becoming tawny. Lamellæ adnate, pallid, afterward changing to brown.

About the trunks of trees in woods; perhaps scarce, as I have found it but once. Pileus 3-5 in. broad, stipe 3-4 in. long. The pileus is characterized by the peculiar bright tawny or flame-colored hue, with densely appressed or fasciculate fibrillæ. When again found it needs to be more closely observed.

136. A. VELUTINUS, Pers.—Pileus somewhat fleshy, campanulate, then expanded, at length obtusely umbonate, even, at first tomentose, with appressed fibrils, afterward becoming glabrous, hygrophanous; the flesh very thin, concolorous. Stipe hollow, fibrillose-silky, sordid-argillaceous. Lamellæ seceding, rather close, brown, black-punctate.

In the streets of the suburbs, along the country roads, etc. Size various, often extremely large, very fragile. Pileus not scaly, when fresh lurid, partly dry, tawny, when dry rather clay-color.

B. Pileus glabrous, hygrophanous.

137. A. CANDOLLEANUS, Fr.—Pileus somewhat fleshy, campanulate-convex, explanate, obtuse, glabrous, hygrophanous. Stipe hollow, fragile, somewhat fibrillose, white, striate at the apex. Lamellæ rotundate-attached, close, violaceous then brown-cinnamon. Spores brown, oblique, .0090×.0056 mm.

On the ground in woods. Pileus $1\frac{1}{2}$ -3 in. in diameter, stipe $1\frac{1}{2}$ -3 in. high. The colors even of the lamellæ seem to be exceedingly variable; the pileus is commonly cinereous or whitish, darker in the center.

138. A. APPENDICULATUS, Bull.—Pileus fleshy-membranaceous, ovate-expanded, glabrous, hygrophanous, when dry rugose and somewhat atomate. Stipe hollow, equal, glabrous, white, pruinat at the apex. Lamellæ somewhat adnate, close, dry, whitish then fleshy-brown. Spores .005×.004 mm.

Upon trunks especially of beech. Densely cæspitose; pileus 2-3 in. broad, stipe 3 in. in length. Pileus brownish then tawny or pale ochre; the flesh of the same color.

SUBGENUS XXVIII.—PSILOCYBE.

Pileus more or less fleshy, glabrous; the margin at first incurved; the veil none. Stipe somewhat cartilaginous.

139. A. SPADICEUS, Fr.—Rigid. Pileus fleshy, convexo-plane, obtuse, even, moist, hygrophanous. Stipe hollow, tough, pallid, even at the apex. Lamellæ rotundate-attached, dry, close, whitish then fleshy-brown. Spores elliptic, purplish-brown, .0076×.0051 mm.

In grassy grounds of dooryards, lawns and fields, very abundant after rains, in spring and summer. Pileus $1\frac{1}{2}$ -3 in. broad, stipe 2-3 in. long. Pileus even, at first glabrous, rigid, scabrous, umber-brown, becoming pale when dry; the flesh whitish; the margin inflexed, often cracked and split when dry. The lamellæ sometimes finally cinnamon or umber.

TABLE OF THE SUBGENERA OF COPRINARIÆ.

29. PANÆOLUS.—Pileus a little fleshy, not striate.

30. PSATHYRELLA.—Pileus membranaceous, striate.

SUBGENUS XXIX.—PANÆOLUS.

Pileus a little fleshy, not striate, the margin exceeding the lamellæ. Stipe polished, rather firm. Lamellæ variegated.

a. Pileus viscid, shining when dry.

140. A. SOLIDIPES, Peck.—Pileus firm, hemispheric, then somewhat campanulate, smooth, whitish; the cuticle at length breaking up into dingy-yellowish, rather large, angular scales. Stipe firm, smooth, white, solid, slightly striate at the top. Lamellæ broad, slightly attached, whitish, becoming black. Spores black with a bluish tint.

In pastures on piles of dung. Pileus 2-3 in. in diameter, stipe 5-8 in. high. A large species, remarkable for its solid stipe. The scales on the pileus are larger on the disk, becoming smaller toward the margin. The upper part of the stipe is sometimes beaded with drops of moisture.

141. A. FIMIPUTRIS, Bull.—Pileus somewhat membranaceous, conic-expanded, rather gibbous, even, viscid. Stipe slender, equal, glabrous, pallid, marked with an annular zone. Lamellæ attached, livid-blackish. Spores black, .009×.007 mm.

In pastures on dung. Pileus 1-2 in. broad and high, stipe 3-5 in. long. Pileus reticulate rugulose, dark cinereous, livid when dry; the annulus broken into triangular loops or laciniaë fringing the margin; stipe scaly-tomentose, pulverulent, often beaded with little drops, striate above, nearly white, at length reddish.

b. Pileus dry, glabrous.

142. A. CAMPANULATUS, Linn.—Pileus a little fleshy, campanulate, dry, even, glabrous, somewhat shining. Stipe equal, straight, reddish; the apex striate, dark-pulverulent. Lamellæ attached, ascending, variegated with gray and black. Spores black.

On manured ground. Pileus $\frac{3}{4}$ -1½ in. in diameter, $\frac{3}{4}$ -1 in. in height; stipe 3-4 in. long. Pileus from brown changing to reddish.

143. A. FIMICOLA, Fr.—Pileus a little fleshy, campanulate-convex, obtuse, glabrous, opaque, marked around the margin with a narrow brown zone. Stipe fragile, elongated, equal, pallid, white-pruinat at

the apex. Lamellæ adnate, broad, variegated with gray and sooty. Spores black.

On dung and on manured land, in spring and summer. Pileus 1-2 in. broad, stipe 2-4 in. long. Pileus when moist commonly sooty-canescens, when dry argillaceous-canescens.

SUBGENUS XXX.—*PSATHYRELLA*.

Pileus membranaceous, striate, the margin not exceeding the lamellæ. Lamellæ uniformly black-sooty, not variegated.

a. Stipe straight, glabrous.

144. *A. GRACILIS*, Fr.—Pileus somewhat membranaceous, conic, striatulate, hygrophane, when dry not striate. Stipe slender, straight, naked, pallid. Lamellæ broadly adnate, rather distant, cinereous-blackish; the edge obsoletely rose-color. Spores black, elliptic. very large, $.014 \times .008$ mm.

In low grounds along fence-rows. Pileus $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, stipe 3-5 in. high. Pileus at first livid or brownish, then changing to ochraceous, alutaceous, pinkish or whitish.

b. Stipe flexuous, pruinose at the apex.

145. *A. ATOMATUS*, Fr.—Pileus somewhat membranaceous, campanulate, obtuse, striatulate, hygrophane, when dry rugulose, entire, furfuraceous with shining atoms. Stipe lax, fragile, white; the apex white-furfuraceous. Lamellæ adnate, broad, cinereous-blackish. Spores black, elliptic, large $.011 \times .008$ mm.

Among chips and rotten wood in woods. Pileus $\frac{1}{2}$ -1 in. in diameter, stipe 2-3 in. long. Pileus at length plano-expanded, ochraceous inclining to pale reddish, at length cream-colored or nearly white. Stipe somewhat rooting, more or less cottony at the base.

146. *A. DISSEMINATUS*, Pers.—Pileus membranaceous, ovate-campanulate, furfuraceous, afterward naked, sulcate-plicate, entire, changing color. Stipe lax, somewhat flexuous, fragile, furfuraceous then glabrous. Lamellæ adnate, broadly linear, white-cinereous, then changing to black. Spores black, elliptic, $.0076 \times .0051$ mm.

About trunks of trees and on the ground, in woods. Gregarious and cæspitose, sometimes in countless numbers. A very small Agaric; pileus about one fourth of an inch in breadth, the stipe about 1 inch long. Pileus yellowish or ochraceous, at length cinereous or whitish, sometimes with a pearly tint toward the margin.

[TO BE CONTINUED.]

A REVISION OF THE GENUS *CLEMATIS* OF THE UNITED STATES; EMBRACING DESCRIPTIONS OF ALL THE SPECIES, THEIR SYSTEMATIC ARRANGEMENT, GEOGRAPHICAL DISTRIBUTION, AND SYNONYMY.

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[Read by title before the American Association for the advancement of Science, August, 1882.]

This Revision of the Genus *Clematis*, native to the United States, has been prepared as a contribution toward that great desideratum of all botanists, a Flora of the United States.

In this monograph I have collected the descriptions of all the species of the United States, have given their geographical distribution, and as full a synonymy as I have been able to get together. For this latter portion I am indebted to Mr. Sereno Watson's Index to North American Botany. For information in regard to range of species, I am indebted to many correspondents; and for the examination of specimens, am under obligations to Mr. Isaac Martindale, of Camden; Dr. George Vasey, of the Agricultural Department at Washington; Mr. Parker, of the Philadelphia Academy, and Mr. Watson, of Cambridge.

The Genus *Clematis*, Linn., forming the tribe *Clematidæ* of the *Ranunculaceæ*, contains about one hundred species. They are widely distributed over all the warm and temperate regions of the earth, but like the rest of the order, are rare or unknown in the low, hot, damp regions of Africa, Asia and America. The species delight most in dry elevated localities, and many of them are found in the mountains at elevations of from 6,000 to 10,000 feet above the sea.

Clematis, Linn.

"Involucre none, or resembling a calyx, and situated next to the flower. Sepals 4 (4-8), colored, in æstivation valvate, or with the edges bent inwards. Petals none, or shorter than the sepals. Anthers linear, extrorse. Achenia terminated by long (mostly plumose or hairy) tails. Perennial, herbaceous or somewhat shrubby plants, mostly sarmentose, with opposite leaves, and fibrous roots." (Torr. & Gray, Flora N. Am., vol. i., p. 7).

SECTION I.—ATRAGENE.—*Some of the outer filaments passing into small petals; peduncles bearing single large flowers, the sepals spreading.*

1. *C. VERTICILLARIS*, DC.—Woody-stemmed climber, almost glabrous; leaves trifoliate, with slender common and partial petioles; leaflets ovate or slightly heart-shaped, pointed, entire, or on sterile stems, 1-3 toothed or lobed; flowers bluish purple (2' to 3' across); tails of the fruit plumose.*

2. *C. ALPINA*, Mill.—A trailing, woody-stemmed plant, 6' high, glabrous but for a few scattered hairs; leaves biternately divided; segments ovate or oblong, lanceolate, acuminate, frequently 3-lobed, irregularly toothed; sepals 4, lance ovate, purplish blue.†

Var. *OCHOTENSIS*, Gray.—With linear antheriferous petals.‡ This is the form commonly found in the Rocky mountains, and differs from *C. alpina* and *C. Siberica*, only in the development of the petals.

SECTION II.—CLEMATIS proper.—*Petals entirely wanting.*

(1) *Flowers solitary, pedunculate.*

a.—*Stems erect, simple or branching.*

+ *Leaves divided.*

3. *C. BALDWINII*, Torr. & Gray.—Erect, 1° - $1\frac{1}{2}^{\circ}$ high, simple or a little branching, slender, slightly pubescent; leaves varying from oblong to linear lanceolate, entire, or 3-cleft or lobed, lobes linear, often slightly lacinate, sometimes quite simple, 4'' to 6'' wide, narrowed at base into a short petiole; peduncle terminal, 8' to 10' long, one flowered; flower cylindrical-campanulate; sepals purplish externally, yellowish within; tails of carpels 2' to 3' long, very plumose.§

4. *C. DOUGLASII*, Hooker.—“Stem herbaceous, 1° to 2° high, simple, one flowered; leaves 2-3 pinnatifid (or the lower ones more simple), the segments linear or linear lanceolate, both stem and leaves more or less hairy; flower nodding, the naked peduncle erect and elongated in fruit; sepals thick, woolly at the apex, more or less spreading, deep brownish purple, paler externally.”||

5. *C. SCOTTII*, Porter.—“More or less villous, with soft-spreading

* Gray's Manual, p. 35.

† Watson, Bot. Nev. & Utah (vol. v., King's Sur.) p. 3, and Porter & Coulter, Fl. Colorado, p. 1.

‡ Watson, *Ibid.*, p. 4

§ Torrey & Gray, Fl. vol. i., p. 8.

|| Watson, *l. c.*, p. 3.

hairs ; bushy branching, from a suffrutescent base ; branches erect, 9'-18', not climbing ; leaves opposite, on rather long petioles, pinnate ; leaflets 5 pairs, ovate or lanceolate, acute or acuminate, petiolate, strongly veined beneath, the lower ones often 2-3 cleft ; flowers axillary and terminal, nodding ; peduncles 3'-6' ; sepals 4, ovate, with reflexed summits, nearly one inch long, dark or brownish purple, thickish but not leathery, as in *C. Viorna*, more or less tomentose on the outside ; carpels silky pubescent, with densely plumose tails, 1'-1½' in length."*

++ Leaves simple or lobed.

6. *C. OCHROLEUCA*, Aiton (*C. ovata*,† Pursh).—Stem simple, silky pubescent, leaves reticulately veined, ovate, sometimes 3-lobed, subsessile, upper surface glabrous when old, silky beneath ; upper leaves rather acute ; flower solitary, terminal, pedunculate, inclined, yellowish or greenish, erect in fruit ; sepals 4, silky externally ; tails of the carpels very plumose.‡

Var. *FREMONTII*, James (*C. Fremontii*,§ Wats.).—Stem stout and usually branched ; leaves sessile ; sepals purple ; tails of carpels short, naked above, silky or hairy at base.

Between the *C. ovata*, Pursh, and *C. ochroleuca*, Aiton, I can not find sufficient difference to justify a separation. The characters distinguishing the two species are only the silky stem and leaves, and yellow flowers of *ochroleuca*, against the smooth stem and leaves, and purple flowers of *ovata*. But the older leaves of *ochroleuca* become glabrous, and so resemble the *ovata*: and as Pursh described his species from a dried specimen, he may well have taken the flower to be purple, because a difference in color would not be noticeable in dried specimens. I have seen but a single specimen labelled *ovata* in any of the large herbaria of the East, and that at

* Porter & Coulter, Fl. Col., p. 1.

† *C. ovata*, Pursh.—Whole plant glabrous ; stem simple, or sometimes climbing ; leaves broadly ovate, on very short petioles, glabrous, glaucous and reticulately veined beneath, the lower subcordate ; peduncle terminal, solitary, one flowered ; flower inclined, nearly as large as *C. ochroleuca* ; sepals ovate, acuminate, pubescent on margin, purple ; tails of carpels plumose. (Torr. & Gr. Fl. vol. i., pp. 8 and 657.)

‡ Torr. & Gr., l. c, vol. i., p. 7, and Gray's Man., p. 35.

§ *C. Fremontii*, Watson.—"Stem stout, erect, clustered, 6'-12' high, leafy and usually branched, more or less villous tomentose, especially at the nodes ; leaves simple, 3-4 pairs, coriaceous and with the veinlets conspicuously reticulated, sparingly villous, sessile, broadly ovate, entire or few toothed, 2'-4' long ; flowers terminal, nodding, the thick purple sepals an inch long, narrowly lanceolate ; tomentose at the margin, recurved at the tip, the peduncles becoming erect in fruit, akenes silky 3"-4" long, the tails less than an inch long, naked above, silky at base." (Proc. Am. Acad. vol. x., p. 339. Quoted in Bot. Gaz., vol. ii., p. 12.)

Philadelphia, and it is in appearance simply a small *ochroleuca*. Dr. A. Gray has examined the specimens described by Pursh in the Sherard herbarium at Oxford, England, and concludes it to be the same as *ochroleuca*.* Between *ochroleuca* again, and the form described as *Fremontii*, the resemblances are very strong, and the differences extremely slight. The most important difference is in the carpels. In the *ochroleuca* these have the tails long, and very plumose, while in the *Fremontii* they are short, filiform, "naked above, silky below." Yet in a specimen in the herbarium at Harvard, the tails are long and quite hairy, especially at the base. Now as the *Fremontii* is a very local species, being confined, as Mr. Lewis Watson, who rediscovered the plant, writes me, to a space of about forty square miles, would it not be safe to conclude that the *Fremontii*, being the western analogue of the *ochroleuca*, is in reality only a peculiar variety of it, produced by various circumstances of climate and soil? Such, at all events, seems the case to me, and I have therefore called it *C. ochroleuca* var. *Fremontii*.

b.—Stems climbing; leaves pinnate.

7. *C. VIORNA*, L.—Stem striate, smooth; leaflets 3-7, ovate or oblong, sometimes slightly cordate, 2-3 lobed or entire, smooth, uppermost leaves often simple, sparingly reticulated when old; flower terminal, nodding, dark reddish purple; calyx ovate, and at length bell shaped; sepals very thick and leathery, tipped with short recurved points, ovate lanceolate, one inch long; tails of the carpels $1\frac{1}{2}$ inches long, very plumose, persistent.†

Var. *COCCINEA*, James (Long's Expedition) (*C. coccinea*, Engelm.,‡ *C. Texensis*, Buckl.)—Leaflets coriaceous, obtuse, convex, entire, glaucous; flower red, sepals smooth.

Var *PITCHERI*, James (*C. Pitcheri*,§ Torr. & Gr.) Leaflets ovate,

* Note in Herb. at Harvard, and in Curtis' Bot. Mag., Dec. 1881.

† Gray's Man., p. 36, Wood Cl. Bk., p. 201.

‡ *C. coccinea*, Engelm. "Glabrous, stem very slender, climbing, branched; leaves thin, coriaceous, on slender petioles, 3-5 foliate; leaflets on very slender petiolules; the lateral ones broadly ovate or ovate-cordate, obtuse, apiculate, convex, glaucous beneath, entire, reticulately veined; the terminal one larger and broader, entire or 3-lobed; flowers solitary, on very long peduncles, scarlet; perianth ovoid; sepals glabrous, the margins silky-tomentose, thick, coriaceous, ovate lanceolate, erect, the apex acute and recurved; akenes villous, the tails elongated, plumose, persistent." (Curtis' Bot. Mag. Dec. 1881.)

§ *C. Pitcheri*, Torr. & Gr. Stem climbing; leaves pinnate; leaflets 3-9, ovate or somewhat cordate, acute or obtuse, entire or three lobed, sub-sessile, much reticulated, upper leaves often simple; flower nodding, pedunculate; calyx bell-shaped, the dull purplish sepals with narrow and slightly margined recurved points; tails of the carpels filiform, pubescent or villous. (Gray's Man., p. 36, etc.)

sub-sessile, reticulated ; sepals with narrow, slightly margined, recurved points; tails of carpels either filiform and glabrous or appressed silky and villous; leaves very variable.

We have in the preceding an interesting group of what have been considered three distinct species, all possessing points in common, and comparatively few points of difference. The var. *coccinea*, lately erected to a species by Dr. Engelman, though Buckley characterized it as long ago as 1861, under the name of *C. Texensis*, differs from the type *Viorna* mainly in the color of the flower and the obtuseness of the leaflets, points which are very seldom considered sufficient to establish a species. Some leaflets on *Viorna* are obtuse and plainly reticulated, while the color of the flower is a deep reddish-purple. The var. *Pitcheri* differs in the leaflets being nearly sessile, reticulated, sepals with slightly margined points, but principally in having the tails of the carpels filiform and glabrous, or silky and villous.

Now the *Viorna* seems to be the dominant form. In its distribution it overlaps the var. *coccinea* found in Texas, and at the northwest it overlaps var. *Pitcheri* in Illinois and Iowa. Here then we have a species widely spread over the country with several marked varieties, and we shall see that there are not sufficient characters to establish them as distinct species. The stems in all are alike. The leaves vary in the varieties in size and form, but so do they also in themselves. The *Pitcheri* has leaves acute or obtuse, entire or lobed, ovate or lanceolate. The leaves of *coccinea* vary less, but in the species *Viorna*, they are as variable as in the varieties. The flowers in all are almost exactly alike, except as regards color and the presence or absence of pubescence. Lastly, the carpels are alike except in the *Pitcheri*, in which we find, according to Dr. Gray,* two forms, one "(leio-stylis) with the filiform styles completely glabrous from the first; in the other (lasiostylis) they are appressed silky or villous, either only below or for their whole length." There are transitions between them, and the form passes into the *C. filifera*, Benth, of Mexico, which also has naked or pilose styles. Certain forms found in Texas, and referred to as var. "folius tenuioribus etc.," of *reticulata*, seem to be the same as *C. filifera*, Benth., according to specimens in the herbarium at Washington. As this form has been referred by Gray to *Pitcheri*, it will be necessary to reduce the *C. filifera* to a synonym of *C. Viorna*, var. *Pitcheri*.

* Bot. Mag., l. c., Dec. 1881.

8. *C. BIGELOVII*, Torrey.—“Low (?), herbaceous (?),” (in reality as seen in later specimens climbing), smooth; leaves pinnate or bi-pinnate, long petioled, leaflets 7-9, half an inch to an inch in length, membranaceous and inconspicuously veined, 3-lobed or parted: lobes sub-ovate, entire, or incised, peduncles “an inch or two in length” (sometimes four and five inches), one flowered, nodding; calyx sub-campanulate, sepals narrowly oblong, scarcely over half an inch in length, membranaceous in dried state, probably a little thickened in the living plant, but not leathery as in *C. Viorna*, etc.; almost glabrous except the densely tomentose margin, not appendaged, but the obtuse tip spreading; carpels silky pubescent, becoming glabrate, with tails over an inch in length, densely plumose as in *C. Viorna*.*

9. *C. RETICULATA*, Walt.—Stems climbing, leaves pinnate or ternate; leaflets 3-6, oblong, ovate or oval, entire, simple or lobed, obtuse or acute and mucronate, rigidly coriaceous, conspicuously reticulated on both sides, glabrous: peduncle terminal, one flowered, flower nodding, bell-shaped, pale purple; sepals 1'-1½' long, rather coriaceous, ovate lanceolate, velvety externally: tails of the carpels long and plumose.†

10. *C. CRISPA*, Linn.—Stem smooth, climbing; leaves pinnate or ternate; leaflets 3-15, acute, thin, varying from oblong-ovate to lanceolate, acuminate, obtuse or sub-cordate at base, entire or 3-5 parted; peduncle terminal, bearing a large, nodding, bell-shaped, bluish-purple flower; calyx cylindraceous below, the upper half of the sepals dilated and widely spreading, with broad and wavy thin margins; tails of the carpels about an inch long, silky or plumose (in the form originally described with “naked” or pubescent tails).‡

Var. *WALTERI*, Gray (*C. Walteri*, Pursh., *C. lineariloba*, DC.) Leaflets linear or linear lanceolate, 3-4 pairs, the lobes scarcely 2''-3'' wide.§

11. *C. LASIANTHA*, Nutt.—Stem pubescent, or silky tomentose, stout, climbing; leaves ternate, broadly ovate, obtusely cuneiform at base; leaflets incisely toothed, the terminal one three lobed or trifid, 1'-1½' long, 1' broad, almost villous beneath; flowers dioecious, solitary, more than an inch in diameter, on rather stout 1-2 bracted peduncles 3 inches long; sepals cuneate oblong, spreading, villous on both surfaces, obtuse, 6''-10'' long, akenes pubescent.||

* Pacific R. R. Survey Report, vol. iv., p. 61.

† Torr. & Gr., *l. c.*, vol. i., p. 10. Wood's Cl., Bk. p. 201.

‡ Torr. & Gr., vol. i., p. 10. Gray's Man., p. 36. Wood's Cl. Bk., p. 201.

§ Gray-Curtis' Bot. Mag., Dec., 1881.

|| Torr. & Gray, vol. i., p. 9. Brew. & Watson, Bot. Col., vol. i., p. 3.

(2.) *Flowers panicled: stems climbing.*

12. *C. PAUCIFLORA*, Nutt.—Climbing, but inclined to grow erect or bushy, smooth or somewhat silky pubescent, short jointed; leaves pinnate and ternate, short and fascicled; leaflets 3-5, only 3"-9" long, cuneate obovate to cordate, obtuse, mostly 3 toothed or lobed, petioles slightly pubescent; flowers axillary, solitary or few and panicled, on slender pedicels; sepals thin, 4"-6" long; akenes glabrous, with slender plumose tails.*

13. *C. DRUMMONDII*, Torr. & Gr.—Stem slender, angular, somewhat hairy; leaves pinnate, silky villous beneath, sparingly hirsute on the upper surface; leaflets mostly 5, rhombic ovate, incisely 3 lobed, the lobes acute; panicles about as long as the leaves, trichotomously divided; sepals 4, white, oblong, villous externally; tails of carpels more than 2 inches long, densely plumose.†

14. *C. VIRGINIANA*, Linn. (*C. Catesbyana*, Pursh.‡)—Stem climbing 8-15 feet high, supporting itself by the long petioles, smooth; leaves ternate, with three ovate, acute leaflets, which are cut or lobed, and somewhat heart shaped at the base; flowers panicled, polygamo-dioecious, with 4 white, obovate, thin, spreading sepals; carpels with long plumose tails.§

Var. *BRACTEATA*, DC. (*C. holosericea*, Pursh.||)—Pubescent. "Leaflets ovate-lanceolate, entire."¶

In uniting *C. holosericea* and *C. Catesbyana* with *C. Virginiana*, I have been influenced by several considerations. The first species is a very obscure one, described by Pursh from dried specimens in the herbarium of Walter, and differs from *C. Virginiana*, in being pubescent, and in having entire instead of serrate leaflets, two characters which are much too variable to establish specific rank. A specimen

* Torr. & Gr., *l. c.*, vol. i., p. 9, and Brew. and Wats., *l. c.*, vol. i., p. 3.

† Torr. and Gr., *l. c.*, vol. i., p. 9.

‡ *C. Catesbyana*, Pursh.—Stem climbing, minutely pubescent; leaves bi-ternate, or pinnately 5-foliate; leaflets ovate, often slightly cordate, small, mostly 3-lobed, the lobes entire, acute or acuminate; flowers mostly dioecious, in axillary divaricately forked cymes; sepals linear oblong; carpels short tailed, plumose. (Pursh, *Fl. Am.*, vol. ii., p. 736, Torr. and Gr., *l. c.*, vol. i., p. 657).

§ Gray's Manual, p. 36. Wood's Cl. Bk., p. 201.

|| *C. holosericea*, Pursh.—Stem climbing, downy or silky in all its parts; leaves ternate, pubescent both sides; leaflets entire, oblong lanceolate; flowers dioecious, small, white, in paniculate corymbs, few-flowered; linear petals longer than the stamens; carpels long plumed. (Pursh, *l. c.*, vol. ii., p. 384. Wood's Cl. Bk., p. 201.)

¶ Loudon Arbor. et Frutic., vol. i., p. 237.

from Georgia in the Philadelphia Academy Herbarium, is labeled "a mere pubescent variety of *C. Virginiana*," a conclusion I had before reached. The entire leaflets have caused me to refer it to *C. Virginiana*, var. *bracteata*.

Almost the same may be said in respect to *C. Catesbyana*. This is better known, but is also doubtful. A specimen from Florida in the Agricultural Department Herbarium, has much the aspect of *C. Virginiana*, and others in the Herbarium of Mr. I. C. Martindale, would be difficult to separate from *C. Virginiana*. Here again the pubescence and the entire lobes of the leaves constitute the differences between it and the *C. Virginiana*, two differences which should never be alone sufficient to characterize a distinct species.

15. *C. LIGUSTICIFOLIA*, Nutt.—Climbing, somewhat pubescent; stems elongated, sometimes 30 feet long; leaves ternate or mostly five foliate; leaflets coriaceous, broadly ovate to lanceolate, 3-lobed or coarsely toothed, rarely entire or 3 parted, $1\frac{1}{2}$ '-3' long; flowers white, diœcious, in paniculate corymbs; sepals thin, silky, from 4"-6" long; akenes pubescent, tails one to two inches long, plumose.*

Var. *BREVIFOLIA*, Torr. and Gr.—"With nearly smooth, broadly ovate, sub-cordate, three-lobed leaflets."†

Var. *BRACTEATA*, Torr.—"Leaflets 3-5, deeply cordate, incised, lobed, dentate, glabrous on both sides, the bracts of the flower very large, obovate, entire."‡

Var. *CALIFORNICA*, Watson.—"Leaves silky tomentose beneath, often small."§

The two preceding species, *C. Virginiana* and *C. ligusticifolia*, the most widely distributed of the Genus in the United States, are very closely related to each other. The *ligusticifolia* of the West, is the representative of the *Virginiana* of the East, and it is doubtful if it is entitled to rank higher than a geographical variety. The differences are confined almost entirely to the pubescence on the leaves, and to their being 3-foliate in one, and 5-foliate in the other. These differences, the only apparent ones, are by no means constant, for the leaves vary from smooth to very pubescent on both sides, and the leaflets are in the var. *bracteata*, sometimes only 3-lobed as in the *Virginiana*.

* Watson, King's Report, vol. v., p. 3. Torr. and Gr. Fl. vol. i., p. 9. Brew. and Wats. Bot. Cal., vol. i., p. 3.

† Watson, King's Report, vol. 5, p. 3.

‡ Torrey, Bot. Wilkes' Expe., p. 211.

§ Brew. and Watson, Bot. Cal., vol. i., p. 3.

I subjoin the description of *C. Pennsylvanica*, Donn., which must be regarded as a synonym of *C. Virginiana*, L.

"*C. Pennsylvanica*, Donn.—Plant glabrous, the stem somewhat climbing above; leaves ternately cut, the segments petiolate, ovate-oblong, acuminate, a few coarse teeth toward the apex, the base entire, and 3-5 nerved; peduncle axillary, frequently shorter than the petiole, 3-flowered, 3-bracted; flower hermaphrodite; sepals 4, linear-oblong, rather obtuse, velvety without.

"I find dried branches, about a foot long, in the herbarium of Prof. de la Vyne (?), long since deceased, very much like plants cultivated in German gardens since the time of Schreber. Flowers (on these branches) in threes, lateral, not yet expanded, each flower subtended by a leaf like, serrulate or entire bract; the bract of the middle flower often already fallen. These peduncles at the time of evolution (or flowering), short, afterwards perhaps elongated. Flowers small, whitish. Stamens in a single series, flat, brownish. Ovary terminated by plumose styles." (Turez. Bull. Soc. Moscow, vol. xxvii. p. 273.)

This description is very imperfect, and not sufficient to establish or characterize a species. It corresponds very well to some forms of *C. Virginiana*, and to that species is here referred. No habitat is given for it.

In the following table the species are arranged according to what seems their most natural affinities:

SECTION I.—ATRAGENE.

1. *C. verticillaris*, DC.
2. *C. alpina*, Mill.
var. *Ochotensis*, Gray.

SECTION II.—CLEMATIS.

3. *C. Baldwinii*, Torr. & Gray.
4. *C. Douglasii*, Hooker.
5. *C. Scottii*, Porter.
6. *C. ochroleuca*, Aiton (*C. ovata*, Pursh).
var. *Fremontii*, James (*C. Fremontii*, Watson).
7. *C. Viorna*, L.
var. *coccinea*, James (of Long's Expedition) (*C. coccinea*, Engelm.)
var. *Pitcheri*, James (*C. Pitcheri*, T. & G.)
8. *C. Bigelovii*, Torrey.
9. *C. reticulata*, Walter.

10. *C. crispa*, Linn.
var. *Walteri*, Gray.
11. *C. lasiantha*, Nutt.
12. *C. pauciflora*, Nutt.
13. *C. Drummondii*, T. & Gr.
14. *C. Virginiana*, L. (*C. Pennsylvanica*, Donn., *C. Catesbyana*,
Pursh.)
var. *bracteata*, DC. (*C. holosericea*, Pursh.)
15. *C. ligusticifolia*, Nutt.
var. *brevifolia*, Torr. & Gr.
var. *bracteata*, Torrey.
var. *Californica*, Watson.

GEOGRAPHICAL DISTRIBUTION.

Taking now the species in the order in which I have placed them, and in what I take to be the natural relations to each other, I will give the geographical distribution of each.*

No. 1. *Clematis verticillaris*, DC., is the most widely dispersed of all the species. From the mountains of Carolina, on the south, it follows the line of high land northeast, having recorded stations in Pennsylvania at the foot of the Blue Ridge; at Wilmington, Delaware; along the Delaware river, at Phillipsburg, near the Water Gap, Plainfield, and at Preakness mountain, New Jersey; Haverstraw, North Salem, Pine Plains and Fishkill, New York; in Connecticut (rarely); at Johnson, Rhode Island, and thence to Maine. From here the range is westward through New Hampshire and Vermont; at Montreal, Canada; northern and western New York, and along the Great Lakes, being recorded at St. Croix Lake, Wisconsin. It reaches latitude 54° in British America, and is found in the Rocky mountains at Fort Ellis, Montana; Teton mountains at 11,000 feet, and Flat Head river in northern Idaho; in the Wahsatch and Uinta mountains of Utah at 7,000 to 9,000 feet; and in northern California about Cape Mendicino. It is quite rare in most of the eastern stations, but becomes more common toward the west. It is readily seen from the list of stations how it extends from the Atlantic to the Pacific, living in the highlands almost entirely, from as far south as latitude 37°, to north and west as

* In the following account I have availed myself of some of the many local and state floras which have been published from time to time, and am indebted to the many correspondents in various parts of the country who have favored me with lists of the species found in their various localities.

far as 54°. Its distribution is regulated to a very great extent by the configuration of the country and by the climate. The number of stations in northern New Jersey, and in the vicinity of New York, is perhaps to be accounted for by the presence of the glacial drift which covers the northern portion of New Jersey, and to the fact that the Hudson River Valley forms a highway along which it may have emigrated from the north at the time of the glacial epoch; and finding suitable stations in the elevated parts of the country, established itself to a certain extent. That this may have been the case is further countenanced by the fact that it is there associated with many more plants of a northern habitat.*

No. 2. *Clematis alpina*, Mill., the only European species of *Clematis* found in the United States, is recorded as having been found by Parry in Colorado, between 39°-41° north latitude,† but no one has, I believe, since seen it. In Europe it is widely distributed, being found under various forms in the mountains of Austria, Carniola, Piedmont, Dauphine, Hungary, Switzerland, Eastern Pyrenees, etc., at from 2,400 to 6,000 feet elevation.‡ Varieties of it, differing only very slightly, are found in Siberia, toward the Ochotshei Sea and Kamtschatka. The variety *Ochotensis*, is the one common in the Rocky mountains, and we can easily imagine its extension along the highway of the mountain range, from Alaska to Colorado. The localities given are Clear Creek Canon, Chiami Canon, Denver, Middle Park, Gilpin county, and Gray's Peak in Colorado, Cottonwood Canon, in Wahsatch mountains of Utah, and the Teton mountains at 11,000 feet in Northern Idaho. Doubtless it is to be found in British America at the north, and may even extend up to Alaska.

No. 3. *Clematis Baldwinii*, Torr. & Gr., is a very local, strictly southern species, having been recorded, as far as I know, from but three localities, all in Florida. One is at Tampa, on the west coast, another at Mellonville, Lake Monroe, near St. John's River, on the east coast, and the third at St. Augustine. It is a peculiar form, very distinct from any of the other species of the United States, and possibly related to some of the species of South America, reaching Florida, as many other plants have by way of the West India Islands.

No. 4. *Clematis Douglasii*, Hook., is a mountainous western species, strictly confined, as far as known, to the Rocky mountain ranges, and

* See Preface to Cat. of N. J. Plants, by N. L. Britton, p. 10.

† Gray, Pro. Phila. Acad. Nat. Sci., 1863, p. 56.

‡ Loudon Arbor. et Frutic., vol. i., p. 247.

extending from central Colorado, at Middle Park, Clear Creek Canon (middle elevations), and in the Wahsatch and Uinta mountains of Utah, at 6,000 or 7,000 feet, to Fort Ellis, and the Yellowstone in Montana, at Snake River Valley. Teton mountains (11,000 feet), and Flat Head River Valley in Northern Idaho and Washington Territory, and perhaps extending along the same range of mountains, north into British America.

No. 5. *Clematis Scottii*, Porter, is also a very local species, having been described from specimens collected at Soda Springs, 35 miles west of Canon city, and in Fremont county, Colorado. It has also been found in a few other localities in Colorado, by local collectors.

No. 6. *Clematis ochroleuca*, Aiton, has quite a limited and scattered distribution. It is found in the south in the upper districts of Georgia, Carolina and Tennessee, through Virginia (at Alexandria), and Pennsylvania to Staten Island, New York. It is also recorded in two isolated situations, Central Ohio, and in Arkansas. It is possible that the former identification is erroneous, and that the latter, given in Lesquereux's Catalogue of Plants of Arkansas,* is what I have called the variety *Fremontii*. This variety is one having a very local distribution. It was first found by Fremont in one of his early expeditions, and all record lost of the locality. In late years, 1874, Mr. Lewis Watson discovered a locality for the form at Ellis, Kansas, and it has also been found in Cloud county, Kansas. Mr. Isaac Martindale has specimens collected in Missouri. These exhaust all the now known localities for the form. It is so closely related to the *C. ochroleuca*, that I can see no reason for not regarding it as a variety, produced by peculiar circumstances, of that species. The *C. ochroleuca* seems to be one of those species, which not being a dominant form, is dying out. It must at a former period of time have ranged over a more extensive region of country, as the *Viorna* and *Virginiana* do now, but we can not tell the causes of its disappearance. It might, however, have been a dominant species previous to the glacier epoch, and driven from its original home by the cold, has been able to maintain itself only in a few places up to the present time.

No. 7. *C. Viorna*, Linn.—This species, if taken with its varieties, in the significance here given it, covers a large portion of our country. The type is found only as far south as the upper districts of North Carolina (Statesville), Georgia and Alabama. Thence it ranges north

* Geol. of Arkansas, 1860, p. 346.

to Virginia (Little Falls, Peaks of Otter and High Island, at Washington, D.C.) and to Pennsylvania. Thence west through Ohio (general), southern Indiana, Barren and Edmonson counties, Kentucky, to Davenport, Iowa, and to Kansas, where it is said to be "not common."* It is said also to be found in Mississippi. What I have here considered the var. *coccinea* has been found only, I believe, in the vicinity of Austin and New Braunfels, Texas. The other, var. *Pitcheri*, is the western form. The most eastern locality recorded is the Lower Wabash valley in Indiana, which possesses in many respects a peculiar flora, a sort of mingling of eastern, southern and western species. Thence it ranges northwest, said to be abundant at Peoria, Ill., and Davenport, Iowa. Southward it is found between Westport, Missouri, and Cottonwood Creek; on the Red River of Arkansas; at Limestone Gap, and in the Wichita mountains of Indian Territory, and in the valley of the Limpia in northwest Texas.

Taking now the varieties of *C. Viorna*, we see it has a wide distribution. From northern Georgia and Alabama to Texas and Mexico on the south, to Virginia, Ohio and Iowa on the north. And throughout the country inclosed by these boundaries it seems to be abundant. The var. *Pitcheri* passes into *C. flifera*, Benth. of Mexico.

No. 8. *C. Bigelovii*, Torrey, is a very local species, first found in the Sandia Mts. in New Mexico, and since collected near Sante Fe and Silver City. When the country has been more fully explored it will perhaps be found in other localities, but probably in the same vicinity as those now known.

No. 9. *C. reticulata*, Walter, is a southern species, and is recorded as found in the upper districts of Carolina and Georgia, lower districts of Alabama, at Gainesville, Florida, west to Louisiana and Texas (Houston†), and in Chihuahua, Mexico. It is quite closely related to *C. Viorna*, and is possibly an offshoot from that species.

No. 10. *C. crispa*, Linn.—This is a variable species, various forms of it having been described under different names. It is also a southern species, its most northern station being given as Norfolk, Virginia. Thence it ranges south through Carolina and Georgia to Florida (Quincy), and west to Alabama (coast to upper districts), Mississippi, Louisiana and Houston, Texas. The narrow-leaved var. *Walteri*,† is

* Carruth. Cat. Plants seen in Kansas, in Kan. Agr. Report, 1871.

† Dr. Chas. Mohr, MS. note.

† Gray, Cur. Bot. Mag. Dec., 1881,

chiefly a Florida form, and has been described under various names, and only lately restored as a variety. The species is quite a peculiar one, and not closely related to any other species. Loudon says it is found also in Japan,* but he has undoubtedly confounded it with some other species, which is, perhaps, similar.

No. 11. *C. lasiantha*, Nuttall, is a strictly Californian species, being found in the southern portion of the State, about San Diego, thence north in the mountain valleys to Santa Barbara and the Napa Valley, and in the Sierra Nevadas to Plumas county. Nuttall says it is "allied to *C. orientale*, but very distinct."† According to Torrey,‡ Seeman refers it to *C. Peruviana*, and if it is the same it would extend its distribution greatly, to the southern hemisphere in fact, which is not the case with any of the other species of the genus in the United States.

No. 12. *C. pauciflora*, Nuttall, is also a strictly Californian species, the only localities as far as I know being about San Diego, and in the valleys of the Santa Ana mountains, not far from San Juan Capistrano, where I collected it myself. By some, it is considered to be a variety of *lasiantha*,§ and it seems to me to be also closely related to *C. Drummondii*.

No. 13. *C. Drummondii*, Torr. & Gr., another western species, is found in the Pass of the Limpia, on Rio San Felipe and upper Colorado in Texas, at Cienega and Tucson in Arizona, probably south-east California,|| and in Senora, Mexico. In Torrey and Gray's Flora,¶ this species is said to be nearly related to *C. holosericea*, and perhaps not specifically distinct, but it seems to me very different.

No. 14. *C. Virginiana*, Linn., is the commonest and most widely distributed of the corymbose white flowered species, in that respect resembling *C. Viorna*. The typical form is known from the mountains of northern Alabama, thence north to Virginia, and the following localities are given for it. District of Columbia, middle and northern counties of New Jersey, about New York (Pine Plains, and Long Island), Massachusetts, Buffalo, N. Y., Canada, Ohio, Indiana, Kentucky, Michigan (Ann Arbor), Wisconsin, Iowa (Davenport), Missouri (Vermillion river), Nebraska (Valley of Platte), Kansas, Arkansas, and Raton pass mountains near Santa Fe, New Mexico, and British America. If, as I have proposed, *C. Catesbyana* be classed under the

* Arbor. et Frutic., vol. i., p. 243.

† Torr. and Gr. Flora., vol. i., p. 9.

‡ Mex. Bound. Sur., vol. ii.

§ "Seems to be a variety of *C. lasiantha*." Torrey in Mex. Bound. Sur., vol. ii.

|| Brew. and Wats., Bot. Cal., vol. i., p. 3.

¶ p. 657.

species, and *C. holosericea*, under the variety *bracteata*, the distribution of the species will be extended south to Feliciana in Louisiana, and to South Carolina (both given for *holosericea*), and to Florida (near St. John's river on east coast) given for *Catesbyana*. This latter is also known from northern and central Alabama, and Georgia and South Carolina on the coast. Taking then the *Virginiana*, with its variety *bracteata*, as given above, we find the species distributed over the country from Florida and Santa Fe on the south, to Canada, Wisconsin, and British America on the north, certainly a very extended distribution. Its nearest relative, and a very close one it is, is as variable and as widely distributed. But while one is principally confined to the eastern portion of the continent, the other is found in and to the west of the Rocky mountains. This is

No. 15. *C. ligusticifolia*, Nutt.—The typical form extends from San Antonio, and Coppermine creek, in New Mexico, through Colorado (Denver, etc.), to eastern base of the Black Hills, Fort Ellis, Madison Valley and Yellowstone in Montana, and Port Neuf Canon in South Idaho; further, it is found in Utah, Nevada, Sacramento River Valley in California, Klamath Valley and Pit river, Oregon, and at the Dalles of the Columbia. The var. *brevifolia*, Nutt., is found in New Mexico, lower canons of West Humboldt mountains, and East Humboldt range, Nevada, at Bingham City, Utah, Blackfoot river in North Idaho, Washington Territory to the Saskatchewan in British America, and south to Lower California and Arizona. The variety *bracteata*, Torrey, is very local, perhaps not distinct from the others. The only reference I find is the "Botany of the Wilkes Expedition,"* and the habitat there given is the Willamette river, Oregon. Variety *Californica*, Watson, is found in California, from the Sacramento Valley to San Diego, and east to Posé creek and Camp Bowie in Arizona. Taking all these varieties of *ligusticifolia*, then, we find the species ranging from the Mexican boundary to the Saskatchewan in British America, and being confined to the mountains, or found only west of them.

From the resemblance between this species and the *Virginiana*, we may be justified in considering one the representative and probably the descendant of the other. It is likely that the *Virginiana* is the descendant of the *ligusticifolia*, and that the latter has its nearest relatives in the highlands of India, and other parts of Asia. At all

* This book being inaccessible to me, Mr. I. Martindale, of Camden, N. J., was kind enough to send me the description.

events a form found in Napaul, *C. grata*, closely resembles *Virginiana*.^{*} This alone shows the close relationship existing between the two species under consideration.

Having now given the general geographical distribution of the species and varieties of the Genus *Clematis*, let us recapitulate and see to what sources we can refer the species. As I have elsewhere shown,[†] we must probably look to the north for the place of origin of many of our species of plants, and we will find in the glacial theory the principal factor for their dispersion. So, too, we must look back into the past, to the Cretaceous, or at least the Tertiary Epoch, for the time when they first made their appearance. But here we can receive no assistance. We have no data to go by, for though the ancestors of some of our trees have been found there, there are no known remains of *Clematis*, or, indeed, of any of the Ranunculaceæ, from the formations of the western United States. Of some of them we may be sure. *C. alpina*, with its variety *Ochotensis*, has undoubtedly come from Asia and the north along the highway of the Rocky Mountains. Probably this has also been the case with *C. verticillaris*, now comparatively rare, and only found in northern stations. The *C. Virginiana* and *C. ligusticifolia*, we may certainly regard as the descendants of one form, which lived at the north; while the former came south to the eastward, the latter went south on the west and there developed a little differently because of a difference in climate. Probable the *C. grata*, Wall., of India, and the *C. vitalba*, L., of Europe, are derived from the same stock as the *Virginiana* and *ligusticifolia*. The *C. Viorna*, another widely dispersed species, and a marked one, has a near relative in the *C. Japonica*, Thunb., of Japan;[‡] so that probably these two also have descended from a common parent formerly living at the north. Nuttall says his *C. lasiantha* is allied to *C. orientale* of Siberia and other parts of Asia. It has been referred to *C. Peruviana*, and Torrey considers *C. pauciflora*, which is also strictly Californian, a variety of *lasiantha*. Here we have six species which we seem justified in referring to an origin in northern North America and in Asia. Some of the other species, such as *C. crispa*, and *Baldwinii*, seem to be southern in their affinities, and probably have their nearest relatives in the West Indies and South America; while *C. Bigelovii*, *Drummondii*, and *Douglasii*, seem to have their closest relatives in the south and west.

^{*} London, Trees and Shrubs of Great Britain, p. 7.

[†] Geographical Dist. of Indig. Plants common to Europe and the N. E., U. S. In Jour. Cin. Soc. Nat. Hist., April, 1881.

[‡] Japan Exped. under Perry, vol. ii., p. 306.

SYNONYMY.

alpina, Mill.

var. Ochotensis, Gray. = $\left\{ \begin{array}{l} \textit{Atragene alpina}, \text{ Torr.} \\ \textit{A. Ochotensis}, \text{ Pall.} \end{array} \right.$

Americana (*Atragene*), Sims. }*Americana* (*Clematis*), Poir. } = verticillaris, DC.

Baldwinii, Torrey & Gray.

Bigelovii, Torrey.

bracteata, Mœnch.

= Virginiana, var. bracteata, DC.

Catesbyana, Pursh.

= Virginiana, Linn.

coccinea, Engelm.

= Viorna, var. coccinea, James.

Coloradoensis, Buckl.

= Viorna, var. Pitcheri, James.

Columbiana, Torr. & Gray. }*Columbiana* (*Atragene*), Nutt. } = verticillaris, DC.*cordata*, Pursh., }*cordifolia*, Sims. }

= Virginiana, L.

cordata, Sims.

= crispa, Linn.

crispa, Linn.

$\left\{ \begin{array}{l} \textit{cordata}, \text{ Sims.} \\ \textit{crispa} \text{ (} \textit{Viticella} \text{), Spach.} \\ \textit{crispa} \text{ (} \textit{Clematitidis} \text{), Mœnch.} \\ \textit{cylindrica}, \text{ Sims.} \\ \text{var. } \textit{crispa}, \text{ Wood.} \\ \textit{cylindrica} \text{ (} \textit{Viorna} \text{), Spach.} \\ \textit{divaricata}, \text{ Jacq.} \\ \textit{Simsii}, \text{ Sweet.} \\ \textit{Viorna}, \text{ Andl. (not Linn.)} \end{array} \right.$

$\left\{ \begin{array}{l} \textit{cylindrica}, \text{ var. } \textit{lineariloba}, \text{ Wood.} \\ \text{var. } \textit{Walteri}, \text{ Wood.} \\ \textit{lineariloba}, \text{ DC.} \\ \textit{Walteri}, \text{ Pursh.} \end{array} \right.$

var. Walteri, Gray.

=

cylindrica, Sims. }var. *crispa*, Wood. }

= crispa, Linn.

cylindrica, var. *lineariloba*, Wd. }var. *Walteri*, Wood. }

= crispa, var. Walteri, Gr.

divaricata, Jacq.

= crispa, L.

Douglasii, Hook.= *Wyethii*, Nutt.*Drummondii*, Torr. & Gr.= *nervata*, Benth.*Fremontii*, Watson.

= ochroleuca, var. Fremontii, James.

filifera, Benth.

= Viorna, var. Pitcheri, James.

fragrans, Salisb.

= Virginiana, L.

holosericea, Pursh.

= Virginiana, var. bracteata, DC.

lasiantha, Nutt.*lineariloba*, DC.

= crispa, var. Walteri, Gray.

ligusticifolia, Dur. & Hil. (not Nutt.) = *ligusticifolia*, var. Californica,

Wats.

ligusticifolia, Nutt.	} = <i>Virginiana</i> , Hook. (in part, not Linn.)
var. bracteata, Torr.	
var. <i>brevifolia</i> , Benth. (not Nutt.)	
var. <i>brevifolia</i> , Nutt.	
	Wats.
var. <i>Californica</i> , Watson.	= { <i>ligusticifolia</i> , Dur. & Hil. (not Nutt.) <i>ligusticifolia</i> , var. <i>brevifolia</i> , Benth. (not Nutt.)
<i>nervata</i> , Benth.	= <i>Drummondii</i> , Torr. & Gr.
<i>Ochotensis</i> (<i>Atragene</i>), Pall.	= <i>alpina</i> , var. <i>Ochotensis</i> , Gray.
<i>ochroleuca</i> , Aiton,	= { <i>ovata</i> , Pursh. <i>sericea</i> , Michx.
var. <i>Fremontii</i> , James.	= <i>Fremontii</i> , Watson.
<i>ovata</i> , Pursh.	= <i>ochroleuca</i> , Aiton.
<i>pauciflora</i> , Nutt.	
<i>Pennsylvanica</i> , Donn.	= <i>Virginiana</i> , L.
<i>Pitcheri</i> , Torr. & Gray.	= <i>Viorna</i> , var. <i>Pitcheri</i> , James.
<i>Plukenetii</i> , DC.	= <i>Virginiana</i> , Linn.
<i>Purshii</i> , Dietr.	= <i>Virginiana</i> , Linn.
<i>reticulata</i> , Walter.	
<i>Scottii</i> , Porter.	
<i>sericea</i> , Michx.	= <i>ochroleuca</i> , Ait.
<i>Simsii</i> , Sweet.	= <i>crispa</i> , Linn.
<i>Texensis</i> , Buckl.	= <i>Viorna</i> , var. <i>coccinea</i> , James.
<i>urnigera</i> (<i>Viorna</i>), Spach.	= <i>Viorna</i> , Linn.
	{ <i>Americana</i> (<i>Atragene</i>), Sims. <i>Americana</i> (<i>Clematis</i>), Poir.
verticillaris, DC.	= { <i>Columbiana</i> (<i>Atragene</i>), Nutt. <i>Columbiana</i> (<i>Clematis</i>), T. & G.
<i>Viorna</i> , Andr. (not Linn.)	= <i>crispa</i> , Linn.
<i>Viorna</i> , Linn.	= <i>urnigera</i> (<i>Viorna</i>), Spach.
var. <i>coccinea</i> , James.	= { <i>coccinea</i> , Engelm. <i>Texensis</i> , Buckl.
var. <i>Pitcheri</i> , James.	= { <i>Pitcheri</i> , Torr. & Gray. <i>filifera</i> , Benth.
	{ <i>cordata</i> , Pursh. <i>cordifolia</i> , Mœnch. <i>Catesbyana</i> , Pursh.
<i>Virginiana</i> , Linn.	= { <i>fragrans</i> , Salisb. <i>Pennsylvanica</i> , Donn. <i>Purshii</i> , Dietr.
	{ <i>bracteata</i> , Mœnch. <i>holosericea</i> , Pursh.
var. <i>bracteata</i> , DC.	= { <i>bracteata</i> , Mœnch. <i>holosericea</i> , Pursh.
<i>Walteri</i> , Pursh.	= <i>crispa</i> , var. <i>Walteri</i> , Gray.
<i>Wyethii</i> , Nutt.	= <i>Douglasii</i> , Hooker.

A LIST OF THE BIRDS OF BARDSTOWN, NELSON CO.,
KENTUCKY.

By CHARLES WICKLIFFE BECKHAM.

The following list represents, principally, the results of observations made by the writer during parts of five years, on the Birds of the vicinity of Bardstown, Nelson county, Kentucky.

Bardstown is situated in N. Lat. $37^{\circ} 52'$; W. Long. $85^{\circ} 18'$, and is just on the western limit of the "Blue Grass Region." It is forty miles southeast of Louisville, and about one hundred southwest of Cincinnati. Two or three miles northeast of the town, the "Trenton" limestone, the characteristic surface rock of the blue-grass country, disappears and is succeeded by magnesium (commonly called "cavernous") limestone, which, in turn, gives place several miles west of the town to the shaly deposits of the Devonian Age. Hence, the sylvan growth partakes of the peculiarities of both formations. The most characteristic trees are beech, red and white oak, black walnut, butternut, cedar, "yellow poplar" (local for *Liriodendron tulipifera*), sycamore, black gum, dog wood, white elm and hickory (*Carya alba*, *tomentosa* et *glabra*). The country is gently undulating, and is mostly in a high state of cultivation. In summer the greater part of the small water-courses become dry, and there is, of course, a corresponding scarcity of that desirable liquid. In the western part of the county there are still many large tracts of wild, uncultivated land, where such birds as the Pileated Woodpecker, the Ruffed Grouse, and the Wild Turkey rear their "interesting families," in peace and prosperity, undisturbed by the sanguinary pursuit of their hereditary enemies—the sportsman, the "small boy," and the ornithologist.

The list represents hardly two thirds of the birds that are doubtless to be found here, but it is thoroughly trustworthy as far as it goes; for no species has been admitted on any but the best of evidence: out of the one hundred and sixty-seven enumerated, the writer is himself responsible for all but eight of them.

As a plausible *raison d'être* for this paper, it is urged that not a single article on the birds of Kentucky, as such, has ever been published.

The nomenclature adopted, is that of the Smithsonian List of 1881.

Species known to breed here are marked with an asterisk (*), those strongly inferred to do so by a dagger (†).

1. *HYLOCICHLA MUSTELINA (Gm.), Bd.—*Wood Thrush*.—A common summer resident; arrives April 20th, departs October 15th.
2. HYLOCICHLA FUSCESCENS (Steph.), Bd.—*Wilson's Thrush*.—An uncommon migrant in April and May.
3. HYLOCICHLA ALICIE, Bd.—*Gray-cheeked Thrush*.—Common during the last week of April and the first week of May.
4. HYLOCICHLA USTULATA SWAINSONII (Cab.), Ridgw.—*Olive-backed Thrush*.—A common migrant, remains as late as May 20th.
5. HYLOCICHLA UNALASCE PALLASI (Cab.), Ridgw.—*Hermit Thrush*.—Migrant, arrives last of March, departs November 1st.
6. *MERULA MIGRATORIA (L.), Sw. & Rich.—*American Robin*.—Resident. On the 15th of February, 1881, immense numbers of robins began to congregate in the dense cedar groves near Fredericksburg, Washington county, nine miles from Bardstown, and remained there until about March 8th. Thousands were captured by merely picking them off the branches of the cedars at night. The "roost" was raided in force on the night of February 21st, and 8,000 were killed.
7. *MIMUS POLYGLOTTUS (L.), Boie.—*Mockingbird*.—A common summer resident. A few remain all winter, as I have observed them in November, December, January and February. Ten years ago they were comparatively rare here.
8. *GALEOSCOPTES CAROLINENSIS (L.), Cab.—*Catbird*.—A common summer resident.
9. *HARPORHYNCHUS RUFUS (L.), Cab.—*Brown Thrasher*.—A common summer resident. Arrived, 1881, as early as March 3d.
10. *SIALIA SIALIS (L.), Haldem.—*Bluebird*.—A common resident.
11. *POLIOPTILA CÆRULEA (L.), Scl.—*Blue-gray Gnatcatcher*.—An abundant summer resident, arrives April 1st. Fresh eggs found July 2d, when full fledged young were flying about.
12. REGULUS CALENDULA (L.), Licht.—*Ruby-crowned Kinglet*.—A common migrant, arrives April 1st, departs October 12th.
13. REGULUS SATRAPA, Licht.—*Golden-crowned Kinglet*.—A common migrant and winter resident. The last of them leave for the North about April 25th.
14. *LOPHOPHANES BICOLOR (L.), Bp.—*Tufted Titmouse*.—An abundant resident.
15. *PARUS CAROLINENSIS, Aud.—*Carolina Chickadee*.—An abundant resident. Fond of the society of the preceding.
16. *SITTA CAROLINENSIS, Gmel.—*White-bellied Nuthatch*.—A common resident.

17. *SITTA CANADENSIS*, L.—*Red-bellied Nuthatch*.—An irregular fall and winter visitant. Never observed here during mild winters.

18. *CERTHIA FAMILIARIS RUFA* (Bartr.), Ridgw.—*Brown Creeper*.—A winter resident, arrives October 15th, departs April 15th.

19. **THRYOTHORUS LUDOVICIANUS* (Gm.), Bp.—*Carolina Wren*.—An abundant resident. The liveliest and noisiest bird I know. Appears to always have a quarrel on hand with somebody.

20. †*THRYOMANES BEWICKII* (Aud.), Bd.—*Bewick's Wren*.—Not uncommon, probably resident. Almost exclusively found in the immediate vicinity of dwellings.

21. *ANORTHURA TRIGLODYTES HYEMALIS* (V.), Coues.—*Winter Wren*.—A rather common winter resident, arrives October 15th.

22. *CISTOTHORUS STELLARIS* (Licht), Cab.—*Short-billed Marsh Wren*.—Rare. One specimen only, May 1st, 1882.

23. *ANTHUS LUDOVICIANUS* (Gm.), Licht.—*American Titlark*.—Migrant. Captured as late as April 19th, sometimes seen in winter.

24. **MNIOTILTA VARIA* (L.), V.—*Black-and-white Creeper*.—An abundant summer resident. Arrived, 1882, April 1st.

25. †*HELMINTHOPHAGA PINUS* (L.), Bd.—*Blue-winged Yellow Warbler*.—Common from April 10th to May 25th; probably remains to breed.

26. *HELMINTHOPHAGA CHRYSOPTERA* (L.), Bd.—*Golden-winged Warbler*.—Rare. One specimen only, May 11th, 1877.

27. *HELMINTHOPHAGA RUFICAPILLA* (Wils.), Bd.—*Nashville Warbler*. Migrant, not uncommon.

28. *HELMINTHOPHAGA CELATA* (Say), Bd.—*Orange-crowned Warbler*.—Migrant, never detected during spring.

29. *HELMINTHOPHAGA PEREGRINA* (Wils.), Bd.—*Tennessee Warbler*.—Rare. Not seen in spring.

30. †*PARULA AMERICANA* (L.), Bp.—*Blue Yellow-backed Warbler*.—A common summer resident.

31. *PERISSOGLOSSA TIGRINA* (Gm.), Bd.—*Cape May Warbler*.—Migrant; rare. Two specimens only.

32. **DENDRECA ÆSTIVA* (Gm.), Bd.—*Summer Yellowbird*.—A common summer resident, arrives April 15th.

33. *DENDRECA CÆRULESCENS* (L.), Bd.—*Black-throated Blue Warbler*.—A common migrant, arrives May 5th, departs October 10th to 12th.

34. *DENDRECA MACULOSA* (Gm.), Bd.—*Black-and yellow Warbler*.—An abundant migrant, arrives May 7th, departs October 10th.

35. *DENDRECA CORONATA* (L.), Gray.—*Yellow-rump Warbler*.—An abundant winter resident, arrives October 10th, departs May 8th.

36. *DENDRÆCA CÆRULEA (Wils.), Bd.—*Cærulean Warbler*.—A common summer resident, arrives April 10th.

37. DENDRÆCA PENNSYLVANICA (L.), Bd.—*Chestnut-sided Warbler*.—a common migrant. Particularly abundant in September, arrives May 7th, departs October 10th.

38. DENDRÆCA CASTANEA (Wils.), Bd.—*Bay-breasted Warbler*.—Migrant; not common; arrives May 7th.

39. DENDRÆCA STRIATA (Forst.), Bd.—*Black-poll Warbler*.—A rather uncommon migrant, arrives May 7th to 10th, departs October 10th.

40. DENDRÆCA BLACKBURNIÆ (Gm.), Bd.—*Blackburnian Warbler*.—Migrant, very common in September. Arrived, 1882, as early as April 3d, departs last of September.

41. *DENDRÆCA DOMINICA ALBILORA, Bd.—*White-browed, Yellow-throated Warbler*.—A common summer resident. Found along streams, frequenting the sycamore trees (*Plantanus occidentalis*, L.), arrives early in April.

42. †DENDRÆCA VIRENS (Gm.), Bd.—*Black-throated Green Warbler*.—A very common migrant, arrives April 10th, departs October 10th to 15th. The writer saw and identified one on July 14th, 1881, but not having a gun along it was not captured.

43. DENDRÆCA PINUS (Wils.), Bd.—*Pine-creeping Warbler*.—A common migrant in April and September.

44. DENDRÆCA PALMARUM (Gm.), Bd.—*Red-poll Warbler*.—A common migrant; observed in December.

45. †DENDRÆCA DISCOLOR (V.), Bd.—*Prairie Warbler*.—Migrant; common in the spring.

46. †SIURUS AURICAPILLUS (L.), Sw.—*Golden-crowned Thrush*.—Common in spring and fall.

47. SIURUS NÆVIUS (Bodd.), Coues.—*Small billed Water Thrush*.—Migrant; rare.

48. *SIURUS MOTACILLA (V.), Coues.—*Large-billed Water Thrush*.—An abundant summer resident. Every small water-course has its pair. Arrives April 1st.

49. OPORORNIS AGILIS (Wils.), Bd.—*Connecticut Warbler*.—An uncommon migrant in May.

50. *OPORORNIS FORMOSA (Wils.), Bd.—*Kentucky Warbler*.—A common summer resident. Arrives April 20th.

51. GEOTHYLPIS PHILADELPHIA (Wils.), Bd.—*Mourning Warbler*.—An uncommon migrant in May.

52. **GEOTHYLPS TRICHAS* (L.), Cab.—*Maryland Yellowthroat*.—An abundant summer resident. Arrives April 20th; departs October 10th to 12th.

53. **ICTERIA VIRENS* (L.), Bd.—*Yellow breasted Chat*.—A common summer resident. Arrives April 25th.

54. *MYODIOCTES MITRATUS* (Gm.), Aud.—*Hooded Warbler*.—An uncommon migrant in May.

55. *MYODIOCTES PUSILLUS* (Wils.), Bp. — *Black-capped Yellow Warbler*.—Migrant in May; not common.

56. *MYODIOCTES CANADENSIS* (L.), Aud.—*Canadian Fly-catching Warbler*.—An abundant migrant in May; arrives 10th to 15th. Always one of the last of the *Mniotiltidae* to appear.

57. **SETOPHAGA RUTICILLA* (L.), Sw.—*American Redstart*.—A common migrant and summer resident. Very few remain to breed; arrives April 23d, departs about September 15th. Fresh eggs found May 27th.

58. **VIREOSYLVA OLIVACEA* (L.), Bp.—*Red-eyed Vireo*.—An abundant summer resident; arrives April 10th.

59. *VIREOSYLVA PHILADELPHICA*, Cass.—*Philadelphia Vireo*.—Rare. One specimen only, May 17th, 1877.

60. **VIREOSYLVA GILVA* (V.), Cass.—*Warbling Vireo*.—A common summer resident; arrives May 1st.

61. †*LANIVIREO FLAVIFRONS* (V.), Bd.—*Yellow-throated Vireo*.—Common; arrives April 20th.

62. *LANIVIREO SOLITARIUS* (V.), Bd.—*Blue-headed Vireo*.—Transient; not common; arrives April 20th, departs October 20th.

63. **VIREO NOVEBORACENSIS* (Gm.), Bp.—*White-eyed Vireo*.—An abundant summer resident; arrives April 15th to 20th. Fresh eggs found May 16th.

64. †*AMPELIS CEDRORUM* (V.), Bd.—*Cedar Waxwing*.—An irregular, but, at times, abundant resident.

65. **PROGNE SUBIS* (L.), Bd.—*Purple Martin*.—A common summer resident; arrives March 20th.

66. †*PETROCHELIDON LUNIFRONS* (Say), Lawr.—*Cliff Swallow*.—A rather common summer resident.

67. **HIRUNDO ERYTHROGAstra*, Bodd.—*Barn Swallow*.—An abundant summer resident; arrives about April 20th.

68. †*COTILE RIPARIA* (L.), Boie.—*Bank Swallow*.—A common summer resident.

69. **STELGIDOPTERYX SERRIPENNIS* (Aud.), Bd.—*Rough-winged Swallow*.—A common summer resident. Nests in natural cavities in limestone cliffs.

70. *PYRANGA RUBRA* (L.), V.—*Scarlet Tanager*.—An abundant migrant in May and September. Not detected during summer; arrives May 1st.

71. **PYRANGA ÆSTIVA* (L.), V.—*Summer Redbird*.—A common summer resident; arrives April 20th to 25th. Fresh eggs are generally to be found about May 15th. Their nesting sites are confined exclusively to "the open," and almost always near a path or road. The terminal portion of a lower limb is selected upon which the nest is "saddled"—the beech (*Fagus ferruginea*, Ait.) being preferred. They frequently build in the immediate vicinity of dwellings. One was taken last May in a small dogwood, directly over a constantly frequented paved way, and within twenty or thirty feet of the house. About 80 per cent. of the nests contain three eggs; the remainder four. The nests occasionally contain eggs of the Cowbird.

72. *CARPODACUS PURPUREUS* (Gm.), Bd.—*Purple Finch*.—A common migrant. A few probably winter here.

73. *LOXIA CURVIROSTRA AMERICANA* (Wils.), Coues.—*American Cross-bill*.—A flock of six or eight individuals appeared here November 18th, 1882, in some pine trees. Never observed here before.

74. **ASTRAGALINUS TRISTIS* (L.), Cab.—*American Goldfinch*.—An abundant resident. More abundant in spring and fall than in summer and winter.

75. *CHRY SOMITRIS PINUS* (Wils.), Bd.—*Pine Goldfinch*.—Observed two small flocks here in November, 1882, for the first and only time.

76. **PYRGITA DOMESTICA*, Cuv.—*English House Sparrow*.—This obtrusive alien made his appearance here about three or four years ago, and is increasing at a rapid rate.

77. *PASSERCULUS SANDWICHENSIS SAVANNA* (Wils.), Ridgw.—*Savannah Sparrow*.—A common migrant; arrives about March 20th.

78. **POECETES GRAMINEUS* (Gm.), Bd.—*Grass Finch*.—A common summer resident; arrives February 15th, departs about November 20th.

79. **COTURNICULUS PASSERINUS* (Wils.), Bp.—*Yellow-winged Sparrow*.—A common summer resident. Fresh eggs found May 20th.

80. **CHONDESTES GRAMMICA* (Say), Bp.—*Lark Finch*.—A common summer resident. Arrives April 22d. They hatch two broods of young. The young of the first brood are fully fledged, and able to fly about June 25th.

81. *ZONOTRICHIA LEUCOPHRYS* (Forst.), Sw.—*White-crowned Sparrow*.—A common migrant in May.

82. *ZONOTRICHIA ALBICOLLIS* (Gm.), Bp.—*White-throated Sparrow*.

—A common migrant. A few probably winter here. Found as late as May 18th.

83. *SPIZELLA MONTANA* (Forst.), Ridgw.—*Tree Sparrow*.—A common winter resident. Arrives October 12th.

84. **SPIZELLA DOMESTICA* (Bartr.), Coues.—*Chipping Sparrow*.—A common summer resident. Arrives March 5th; departs November 25th to December 25th.

85. **SPIZELLA PUSILLA* (Wils.), Bp.—*Field Sparrow*.—A common summer resident. Arrives March 1st; departs December 1st.

86. *JUNCO HYEMALIS* (Wils.), Bp.—*Black Snowbird*.—An abundant winter resident from October 25th to April 15th.

87. †*PEUCEEA ÆSTIVALIS ILLINOENSIS*, Ridgw.—*Oak-woods Sparrow*.—Rare; only one specimen; April 28th, 1877.¹

88. *MELOSPIZA PALUSTRIS* (Wils.), Bd.—*Swamp Sparrow*.—A rather uncommon migrant; arrives April 1st to 10th.

89. **MELOSPIZA FASCIATA* (Gm.), Scott.—*Song Sparrow*.—An abundant resident.

90. *MELOSPIZA LINCOLNI* (Aud.), Bd.—*Lincoln's Finch*.—A not very common migrant in May.

91. *PASSERELLA ILIACA* (Merrem), Sw.—*Fox-colored Sparrow*.—An abundant migrant in March and November. A few winter here.

92. †*PIPILO ERYTHROPHthalmus* (L.), V.—*Chewink: Towhee*.—A common resident.

93. **CARDINALIS VIRGINIANUS* (Briss), Bp.—*Cardinal Grosbeak*.—An abundant resident.

94. *ZAMELODIA LUDOVICIANA* (L.), Coues.—*Rose-breasted Grosbeak*.—A rather uncommon migrant in May.

95. **PASSERINA CYANEA* (L.), Gray.—*Indigo Bunting*.—An abundant summer resident; April 20th to October 15th.

96. **SPIZA AMERICANA* (Gm.), Bp.)—*Black-throated Bunting*.—A very common summer resident.

97. **MOLOTHRUS ATER* (Bodd.), Gray.—*Cowbird*.—A common summer resident; departs about November 20th.

98. **AGELEUS PHENICEUS* (L.), V.—*Red-and-buff-shouldered Blackbird*.—A common summer resident.

99. **STURNELLA MAGNA* (L.), Sw.—*Meadow Lark*.—Resident. Abundant in spring and fall.

100. **ICTERUS SPURIUS* (L.), Bp.—*Orchard Oriole*.—A common summer resident; arrives April 25th.

¹ See this JOURNAL, Vol. iv., 1881, pp. 339-340.

101. **ICTERUS GALBULA* (L.), Coues.—*Baltimore Oriole*.—A common summer resident ; arrives April 25th.

102. *SCOLECOPHAGUS FERRUGINEUS* (Gm.), Sw.—*Rusty Blackbird*.—A common migrant.

103. **QUISCALUS PURPUREUS ÆNEUS*, Ridgw.—*Bronzed Grackle*.—Summer resident ; very abundant in early spring. A noisy colony of them have for many years bred in some pine trees in a large yard in Bardstown.

104. **CORVUS FRUGIVORUS*, Bartr.—*Common Crow*.—An abundant resident.

105. **CYANOCITTA CRISTATA* (L.), Strickl.—*Blue Jay*.—Resident ; very abundant in the fall. Nests generally found in tall trees near dwellings.

106. *EREMOPHILA ALPESTRIS* (Forst.), Boie.—*Shore Lark*.—Fall (and winter?) visitant.

107. **TYRANNUS CAROLINENSIS* (L.). Temm.—*Kingbird : Bee Martin*.—An abundant summer resident ; arrives April 20th. Several years ago, in May, I saw one of these birds occupying an exposed perch on a pear tree in bloom, about which many bees were darting. Several times I observed that he caught the insects without leaving the perch, by quickly turning his head, and "grabbing" them. My attention being thoroughly aroused, I noticed that many of them seemed to fly directly towards the bird ; the majority appearing to "shy off" a short distance from him and change their courses, but very few escaped him. Did the thrifty *Hymenoptera* mistake the fully displayed crimson crown for a flower ? Perhaps this is another argument for the natural selection theory. Once since I have observed the same phenomenon.

108. **MYIARCHUS CRINITUS* (L.), Cab.—*Great-crested Flycatcher*.—An abundant summer resident. More numerous than the preceding ; arrives April 20th. Fresh eggs to be had May 25th.

109. **SAYORNIS FUSCUS* (Gm.), Bd.—*Pewee*.—A common summer resident. A few probably winter here, as I have observed them as late as December 31st, and in February. Fresh eggs found March 29th, '82.

110. **CONTOPUS VIRENS* (L.), Cab.—*Wood Pewee*.—An abundant summer resident.

111. *EMPIDONAX FLAVIVENTRIS*, Bd.—*Yellow-bellied Flycatcher*.—An uncommon migrant.

112. **EMPIDONAX ACADICUS* (V.), Bd.—*Acadian Flycatcher*.—A common summer resident ; arrives May 1st. Fresh eggs found May 20th.

113. *EMPIDONAX MINIMUS*, Bd.—*Least Flycatcher*.—A common migrant in April and May.

114. **TROCHILUS COLUBRIS*, L.—*Ruby-throated Hummingbird*.—A common summer resident; arrives about April 25th.

115. **CHÆTURA PELASGICA* (L.), Bd.—*Chimney Swift*.—An abundant summer resident; arrives about April 10th.

116. †*CAPRIMULGUS VOCIFERUS*, Wils.—*Whip-poor-will*.—An uncommon summer resident.

117. **CHORDEILES POPETUE* (V.), Bd.—*Night Hawk*.—Summer resident. Abundant in August and September, and excessively so October 1st, 2d and 3d, 1879.

118. **PICUS VILLOSUS*, L.—*Hairy Woodpecker*.—Resident, not very common. More numerous in winter.

119. **PICUS PUBESCENS*, L.—*Downy Woodpecker*.—A common resident.

120. *SPHYRAPICUS VARIUS* (L.), Bd.—*Yellow-bellied Woodpecker*.—Rather common in the fall, occasionally seen in winter.

121. **HYLOTOMUS PILEATUS* (L.), Bd.—*Pileated Woodpecker*.—An uncommon resident in heavily wooded portions of the county.

122. **CENTURUS CAROLINUS* (L.), Bp.—*Red-bellied Woodpecker*.—A common resident.

123. **MELANERPES ERYTHROCEPHALUS* (L.), Sw.—*Red-headed Woodpecker*.—Resident. Very abundant at times, but occasionally none are seen for several months.

124. **COLAPTES AURATUS* (L.), Sw.—*Yellow-shafted Flicker*.—An abundant resident.

125. **CERYLE ALCYON* (L.), Boie.—*Belted Kingfisher*.—Rather common. Not observed in winter.

126. **COCCYZUS AMERICANUS* (L.), Bp.—*Yellow-billed Cuckoo*; "*Rain Crow*."—A common summer resident; arrives about May 1st, departs October 10th.

127. †*COCCYZUS ERYTHROPHthalmus* (Wils.), Bd.—*Black-billed Cuckoo*.—A rather uncommon summer resident.

128. *ALUCO FLAMMEUS AMERICANUS* (Aud.), Ridgw.—*American Barn Owl*.—An owl in the museum of the Louisville Polytechnic Society, shot about May 20th, 1882, in Bullitt county, 15 or 20 miles north of here, is supposed to be of this species.

129. *ASIO ACCIPITRINUS* (Pall.), Newton.—*Short-eared Owl*.—Rare. One specimen only, November 17th, 1881.

130. **SCOPS ASIO* (L.), Bp.—*Little Screech Owl*.—A common resident. Young fully fledged and flying, about May 31st.

131. **BUBO VIRGINIANUS* (Gm.) Bp.—*Great Horned Owl*.—A common resident. A gentleman near here captured six or eight within a week, with steel traps, placed upon a conspicuous perch in his barnyard, greatly to the supposed gratification of the feathered denizens thereof, upon whom they had been depredating.

132. *NYCTEA SCANDIACA* (L.), Newton.—*Snowy Owl*.—Rare. Winter visitant, Audubon mentions one taken "near Bairdstown, Ky.," and several years ago Mr. E. E. McKay, of this place, shot one sitting on a gate-post during a snow storm.

133. **TINNUNCULUS SPARVERIUS* (L.), V.—*Sparrow Hawk*.—A common resident, very wary; understanding thoroughly how to take care of their skins. In Florida, where I have frequently observed them, they are very unsuspicious, and can be easily approached.

134. *PANDION HALIETUS CAROLINENSIS* (Gm.), Ridgw.—*Fish Hawk*.—Rare. But one specimen; shot by Mr. Rowan Wickliffe, in April, 1882.

135. *ACCIPITER COOPERI*, Bp.—*Cooper's Hawk*.—Rather common.

136. **ACCIPITER FUSCUS* (Gm.), Bp.—*Sharp-shinned Hawk*.—A common resident.

137. **BUTEO LINEATUS* (Gm.), Jard.—*Red-shouldered Hawk*.—Resident. Probably the most common hawk found here.

138. *HALIETUS LEUCOCEPHALUS* (L.), Savig.—*Bald Eagle*.—A newspaper paragraph ("Nelson County Record," Jan. 27, 1881) mentions the fact of one having been seen for several days near Boston, in this county.

139. **CATHARTES AURA* (L.), Illig.—*Turkey Buzzard*.—A common resident; most abundant in summer.

140. †*CATHARISTA ATRATA* (Wils.), Less.—*Black Vulture*; *Carrion Crow*.—Uncommon summer resident.

141. *ECTOPISTES MIGRATORIA* (L.), Sw.—*Passenger Pigeon*.—A common migrant. There was an immense "flight" of them about fifteen years ago.

142. **ZENAIIDURA CAROLINENSIS* (L.), Bp.—*Mourning Dove*.—A common resident.

143. †*MELEAGRIS GALLOPAVO AMERICANA* (Bartr.), Coues.—*Wild Turkey*.—Said to still occur, sparingly, in the western part of the county.

144. **BONASA UMBELLUS* (L.), Steph.—*Ruffed Grouse*.—Not uncommon in suitable places.

145. **ORTYX VIRGINIANA* (L.), Bp.—*Bob White*; *American Quail*.—

A common resident, but with hawks, cold weather, and sportsmen, has a hard time of it in the "struggle for existence."

146. ARDEA HERODIAS, L.—*Great Blue Heron*.—An uncommon migrant.

147. HERODIAS ALBA EGRETTE (Gm.), Ridgw.—*American Egret*.—Rare. Mr. J. W. Fowler, of Louisville, shot one in October, 1881, near Fairfield, in this county.

148. GARZETTA CANDIDISSIMA (Gm.), Bp.—*Snowy Heron*.—A hunter informs me that several years ago he shot a "white fly-up-the-creek," near here, which is probably referable to this species.

149. *BUTORIDES VIRESCENS (L.), Bp.—*Green Heron*.—A common summer resident; arrives about April 20th. Fresh eggs obtained May 12th, 1881.

150. NYCTIARDEA GRISEA NÆVIA (Bodd.), Allen.—*Black-crowned Night Heron*.—Migrant in May; not uncommon.

151. BOTAURUS LENTIGINOSUS (Montag.), Steph.—*American Bittern*.—An uncommon migrant.

152. *OXYECHUS VOCIFERUS (L.), Reich.—*Killdeer*.—Resident. Common in the spring, but rare in summer and winter.

153. †PHILOHELA MINOR (Gm.), Gray.—*Woodcock*.—A rather uncommon migrant.

154. GALLINAGO MEDIA WILSONI (Temm.), Ridgw.—*Wilson's Snipe*.—An abundant migrant in March and April.

155. RHYACOPHILUS SOLITARIUS (Wils.), Cass.—*Solitary Sandpiper*.—A common migrant.

156. TRINGOIDES MACULARIUS (L.), Gray.—*Spotted Sandpiper*.—A common migrant; arrives April 5th to 10th. Not observed in summer.

157. RALLUS VIRGINIANUS, L.—*Virginia Rail*.—A rare migrant. But one specimen, May 10th, 1882.

158. PORZANA CAROLINA (L.), Bd.—*Sora Rail*.—A rather common migrant in October. Not observed in spring.

159. PORZANA NOVEBORACENSIS (Gm.), Bd.—*Little Yellow Rail*.—An uncommon migrant in the Fall.

160. FULICA AMERICANA, Gm.—*American Coot*.—A rather uncommon migrant. In October, 1880, two were captured alive and brought to me. They were kept during the winter in confinement, and became very tame. In April they were liberated in the yard, with the poultry, and made no attempt at all to leave. They soon "made themselves at home," and by their strongly evinced disposition to assert their rights, enforced the respect of the numerous domestic birds with whom they were thrown in contact, and who seemed inclined, at first, to regard

them as intruders, who were to be vigorously put down. The nearest water was a spring branch, a hundred yards distant, which they regularly visited two or three times a day. They remained all summer, apparently perfectly satisfied with their hum-drum domestic life, but in September they wandered off, probably impelled by the migratory instinct.

161. *GRUS AMERICANUS* (L.), Temm.—*Whooping Crane*.—Mr. E. E. McKay informs me that many years ago he has observed this bird near Bloomfield, in this county.

162. *GRUS CANADENSIS* (L.), Temm.—*Sandhill Crane*.—Inserted on the authority of Mr. E. E. McKay, who has frequently seen it on the Beech Fork of Salt river, in this county.

163. *BERNICLE CANADENSIS* (L.), Boie.—*Canada Goose*.—A rather uncommon migrant.

164. *ANAS BOSCHAS*, L.—*Mallard*.—A common migrant.

165. *QUERQUEDULA DISCORS* (L.), Steph.—*Blue-winged Teal*.—A common migrant.

166. **AIX SPONSA* (L.), Boie.—*Wood Duck*; *Summer Duck*.—An uncommon summer resident.

167. *PODILYMUBUS PODICEPS* (L.), Lawr.—*Thick-billed Grebe*; "*Didapper*."—A common migrant.

It will be at once observed, that, as regards the *Striges*, *Accipitres*, and the Water Birds, that the list is very incomplete. Not being sufficiently intimate with our birds of prey, to infallibly identify them at a distance, or expert enough as a collector to capture the wary banditti, I have to leave out many species that are almost certainly to be found here. And on account of the almost total absence of marshes, sloughs and ponds, very few water birds ever halt here in their migrations. The Passerine portion of the list is very much better: the only additional species that can reasonably be expected to be found here being—*Parus atricapillus*, *Troglodytes ædon*, *Telmatodytes palustris*, *Protonataria citrea*, *Helminthotherus vermivorus*, *Hirundo bicolor*, *Lanius ludovicianus*, *Plectrophanes nivalis*, *Coturniculus henslowi*, *Guiraca cærulea*, and *Empidonax pusillus trailli*.

Audubon mentions *Protonataria citrea* as being common near Louisville, and there are many other birds which he alludes to as being found in Kentucky, which the local character of this list excludes.

The 167 species may be roughly arranged as follows: (1) Summer Residents, 51; (2) Constant Residents, 36; (3) Winter Visitants, 16; (4) Migrants, 64.

JANUARY 2d, 1883.

AMERICAN PALÆOZOIC BRYOZA.

By E. O. ULRICH.

[Continued from Vol. 6., p. 92.]

DEKAYIA, Edwards and Haime.

This genus, founded by the eminent French authors, Milne Edwards and Jules Haime, upon their Cincinnati group species, *D. aspera*, is in many respects related to *Heterotrypa*, Nicholson, and *Dekayella*, Ulrich. In the remarks appended to my descriptions of the latter genera, I have already shown the points of difference in their structure. It is therefore quite superfluous to again discuss the generic affinities of *Dekayia*, but the following brief description of the genus, based upon the aggregate of characters presented by six different Trenton and Cincinnati Group species, is, I believe, of more value.

Zoarium growing upward from a more or less largely expanded basal attachment, into, rarely cylindrical, usually flattened branches, which occasionally may become sub-frorescent. Surface sometimes with low monticules, usually, however, nearly even. Cells with polygonal apertures, sometimes apparently consisting of one kind only, but more commonly a few interstitial cells may be detected, which are more especially developed between the individuals constituting the groups of larger cells, that always furnish a more or less conspicuous feature of the surface. Cell-walls always thin, sometimes excessively so, there being but one species (*D. trentonensis*, n. sp.) in which the tube-walls, as the tubes pass from the axial into the peripheral region, are more than only very slightly thickened. Spiniform tubuli in the typical species few, but very large, and not infrequently already present in the axial region of the zoarium. In other species (*D. appressa*, n. sp., and *D. paupera*, n. sp.) they are reduced in size, but their number remains about the same. In one (*D. multispinosa*, n. sp.), they are also comparatively small, but more numerous. When in good state of preservation, at certain stages in the growth of the zoarium, the cell-apertures over larger or smaller patches of the surface are covered by a thin calcareous pellicle. On such covered spots the spiniform tubuli are very conspicuous. Diaphragms straight, usually few, sometimes almost entirely absent, occasionally (in the peripheral region) from one half to one tube-diameter distant from each other.

The genus as above defined includes, beside the type species, five other forms, four of which are described in this number. On account of their simplicity of structure, inexperienced collectors will probably find some difficulty in distinguishing one from the other. It must, however be borne in mind, that the more simple these organisms are, the more important are their variations. In separating them from each other, the characters principally to be taken into consideration are the following : The growth of the zoarium; the size of the cells, and thickness of their walls; the presence or apparent absence of small (interstitial?) cells, and their distribution if present; the size and number of the spiniform tubuli; and lastly, the disposition and number of the diaphragms crossing the tubes.

For comparison I have figured (Pl. VI., fig. 5) a portion of a tangential section of *D. aspera*. It shows the isolated and remarkably developed spiniform tubuli characteristic of this species. The zoarium of *D. aspera* consists of a large basal expansion attached to foreign objects, from the surface of which from one to five sub-cylindrical primary branches arise, that vary in diameter from .4 to .8 of an inch. These are frequently and irregularly divided, until the zoarium has attained a height of four or five inches. The terminal branches are sometimes much flattened, usually however retaining a sub-cylindrical form, while their diameter varies from .2 to .5 inch. The surface is usually elevated into low and rounded monticules, four or five of which may be counted in the space of .5 inch. They are occupied by cells a very little larger than the average, scattered among which it is common to find a limited number of much smaller cells, that may be of the nature of interstitial tubes. Unless badly worn the spiniform tubuli constitute a conspicuous feature of the surface. About five occupy the space of .1 of an inch. Longitudinal sections show that the diaphragms are wanting in the axial region, and remote in the peripheral. The spiniform tubuli are readily recognized by their thick walls and slender cavity. As is the case in all the species of the genus, the walls often assume a peculiar beaded appearance, due to an alternation of light and dark shades of sclerenchyma.

Like the other species of the genus *D. aspera*, is restricted in its vertical range, which is from 300 to 325 feet above low water mark in the Ohio river, at Cincinnati, O. At this height fragments are quite common.

Until lately I was under the impression that Nicholson's *D. attrita* might be advantageously regarded as a distinct variety of *D. aspera*,

but the material now at hand proves this view untenable. Dr. Nicholson's specimens doubtlessly represent the terminal branches of a typical example of Edwards and Haimes' species, the branches of that portion of the zoarium always being more strictly dendroid, and of smaller size than the primary ones.

Dekayia trentonensis, n. sp., is interesting, not only from the fact that it is the earliest species of the genus so far known, but also because its cell-walls are thicker than is usual, and closely resemble those of a *Heterotrypa*. On the other hand, its growth, few if any interstitial tubes, and the large size of the spiniform tubuli, in which respect the species almost rivals *D. aspera*, are characters pointing with much certainty to *Dekayia*.

Another interesting form is found in *D. paupera*, n. sp. In this species the cell-walls are excessively thin, and the spiniform tubuli are greatly reduced in size (*i. e.* compared with those of *D. aspera*). But its general appearance, the absence of interstitial cells, the distribution of the spiniform tubuli, and, more than all, its close relationship to *D. appressa*, confirm me in my opinion that it is properly referred to the genus.

DEKAYIA PELLICULATA, n. sp. (Plate VI., figs. 9 and 9a.)

Zoarium ramose, with smooth, thick, mostly rounded, sometimes slightly flattened branches, arising from a large basal expansion, and gradually tapering from the base, where their diameter varies from .5 to 1.0 inch, to their terminal ends, where the diameter is usually not over .3 inch. On well-preserved examples the cell apertures over large patches of the surface are covered by a thin pellicle, the cell walls appearing as only very faintly elevated lines upon its surface, while the surface extensions of the spiniform tubuli are more distinct and prominent than when the pellicle is wanting. About five may be counted in .1 inch. At distances apart of about .1 inch, the surface shows clusters of cells slightly larger than those of the average size, interspersed among which are small and unequal aggregations of much smaller cells, that in all probability represent the apertures of interstitial tubes. Cells with moderately thin walls, angular, those of the ordinary size varying in diameter from $\frac{1}{120}$ th to $\frac{1}{100}$ th of an inch, while that of those forming the clusters mentioned rarely exceeds $\frac{1}{90}$ th of an inch.

In longitudinal sections the tubes in the axial region have, as usual, excessively thin walls, and are only occasionally provided with an iso-

lated diaphragm, these structures becoming however more numerous in the peripheral region, where they cross the tubes at distances apart of from one half to one tube diameter. The cells turn very abruptly from the axial into the peripheral region, becoming at the same time slightly thickened, and proceeding in their course to the surface they follow a line drawn at a right angle to the longitudinal axis of the branch. In the peripheral region may be noticed quite a number of small, obscurely beaded tubes, in which the diaphragms are somewhat more closely set than in the proper zoecia, and always cross the tube at the periodic points of stricture. In other tubes again the diaphragms are remote and sometimes entirely wanting. On the whole the tabulation of this species is peculiar. The spiniform tubuli are always distinctly visible, and have the usual structure.

Tangential sections show that the cells are thin-walled, and more or less angular, that the spiniform tubuli are comparatively small, and occupy the angle of junction between every three or four cells, and that they are further isolated by being situated between two to four small interstitial cells. From five to fifteen of the latter also occupy the interstices between the larger cells of the clusters, which even in these sections are not very striking.

This species is distinguished from *D. aspera* externally by its more regularly dendroidal growth, smooth surface (so far as monticules are concerned), and less conspicuous spiniform tubuli. Internally the much more numerous diaphragms, and interstitial tubes, beside the smaller spiniform tubuli present weighty points of difference.

Formation and locality: Cincinnati group. Rather rare on the hills back of Cincinnati, O., and Covington, Ky., at an elevation of from 300 to 350 feet above low water mark in the Ohio river.

DEKAYIA TRENTONENSIS, n. sp. (Pl. VI., figs. 6 and 6a.)

Zoarium dendroid, branches slightly compressed, frequently dividing, and from .15 inch (terminal ends) to .4 of an inch (primary branches) in diameter. Entire height of zoarium probably not more than two and one half inches. Surface with low and rounded monticules, of which five may be counted in .5 inch. They are occupied by clusters of cells a little larger than those in the intermediate spaces; occasionally a few small, perhaps interstitial, cells occupy the summit. Cells with comparatively thick walls, and a diameter of about $\frac{1}{120}$ th of an inch, while the diameter of those in the clusters mentioned does not exceed $\frac{1}{90}$ th of an inch. The large spiniform tubuli are quite prominent and easily recognized.

Longitudinal sections show that the tubes in the axial region of the zoarium have very thin and somewhat flexuous walls, and are crossed by diaphragms from two to four tube-diameters distant from each other. They bend into the peripheral region with a gentle curve, the walls at the same time becoming thickened, and the diaphragms much more numerous; in the peripheral region the latter are placed at distances apart of from one fourth to one tube diameter. An occasional small tube is met with, which, as it does not differ in its tabulation from the ordinary tubes, is to be regarded as young. The spiniform tubuli are large and readily enough detected in these sections. They originate in the outer portion of the axial region.

In tangential sections the cell-walls in their fully matured condition are of moderate thickness, and present a median lucid line, on each side of which is a dark ring that immediately surrounds the cell-aperture. The latter represents the secondary deposit of sclerenchyma, while the lighter median line represents the original walls of the cells. The groups of larger cells are sometimes quite conspicuous on account of their size, and frequently a few small cells are incorporated within their limits. On account of the comparatively thick walls the spiniform tubuli are not so conspicuous, as they are when cut through a deeper level, where the cell-walls are thinner. They are isolated and occupy the point of junction between every three, four or five cells.

This species is probably most nearly allied to *D. aspera*, the surface characters of the two being very similar. *D. trentonensis*, however, is a smaller species, and more strictly dendroid. Internally they are distinguished by the thinner cell-walls, and much less numerous diaphragms of *D. aspera*.

Formation and locality: Collected by the author from the upper beds of the Trenton group, at Burgin, Ky., on the Cincinnati Southern Railroad. These strata I regard as equivalent to Safford's Orthis bed.

DEKAYIA APPRESSA, n. sp. (Pl. VI., figs. 7, 7a and 7b).

Zoarium in rare instances subfrondescent, usually ramose, and from one to three inches in height. Branches flattened, dividing frequently, from .3 to .4 of an inch in width, and from .15 to .25 of an inch in thickness. Surface without monticules, but presenting groups of cells somewhat larger than the average, at intervals of about .075 inch, measuring from center to center. When the pellicle is preserved, and this is often the case, the spiniform tubuli are, though rather small and few, apparent enough. But when the pellicle is not preserved

they are not readily detected. Cells thin-walled, and with the exception of the groups mentioned, in all probability consist of one kind only, those of the ordinary size having a diameter of $\frac{1}{130}$ th inch, while that of those in the clusters may exceed $\frac{1}{90}$ th inch. An occasional small cell is met with, that, though I much doubt it, may be of the nature of an interstitial cell.

Longitudinal sections show that the tubes in the axial region are nearly vertical, and that in their course to the surface they bend abruptly outward, their walls, which, as usual, are very thin in the axial region, becoming but slightly thickened as they enter the peripheral portion. Diaphragms are but rarely developed in the "immature," or axial region, and only from five to ten in the "matured" portion of a tube, where they are placed at distances apart of from one half to one tube-diameter. Occasionally a small and short tube may be detected in which the diaphragms appear to be a little more closely set than is the case in the ordinary tubes. The spiniform tubuli being few and of rather small size, are not a conspicuous feature in sections of this kind.

In tangential sections the cells are thin-walled and angular, the groups of larger ones being often very distinct (see fig. 7b, Pl. VI.) On account of the thin cell-walls the spiniform tubuli, though of comparatively small size, are very apparent, occupying the angles of junction of every three, four or five cells.

The frequently branching, sometimes anastomosing zoarium of this species, does not resemble very closely any associate form. Some of the smaller specimens of *Dekayella ulrichi*, Nicholson sp., occurring over two hundred feet lower in the series, bear some external resemblance to fragments of *D. appressa*. The numerous interstitial tubes, and rounded cell-apertures of the former, amply serve the purpose of distinguishing them.

Formation and locality: Cincinnati group, at Cincinnati, Ohio. Rather common at an elevation of about 425 feet above the Ohio river. Its vertical range is restricted to only a few feet.

DEKAYIA PAUPERA, n. sp. (Pl. VI., figs. 10 and 10a.)

Zoarium ramose, the more or less flattened branches growing upward from a large and thinly expanded base, to a height of one and one half inches or a little more; varying in thickness from .15 to .3 of an inch, and in width from .2 to .8 of an inch. Surface without monticules. Cells polygonal, with excessively thin walls, the ordinary

ones having a diameter of about $\frac{1}{120}$ th of an inch. At intervals there are distinct groups of large cells, some of which have a diameter exceeding $\frac{1}{70}$ th of an inch. True interstitial cells are apparently wanting, the few small cells occasionally seen being doubtlessly young ones. The spiniform tubuli I have not been able to detect at the surface. Pellicle not observed.

In longitudinal sections the excessively thin-walled tubes in the axial region are seen to be crossed by few remote diaphragms. The tubes approach the surface with a gentle curve, the thickening of the walls that usually takes place as they enter the peripheral region, is scarcely perceptible in this species. The diaphragms are quite numerous in the "mature" or peripheral region, being about one tube diameter distant from each other. When the section passes through the spiniform tubuli they are, despite their small size, readily detected by the thickened appearance they give to the cell-walls between which they are placed. I have not been able to find any traces of interstitial tubes.

Tangential sections of this species are remarkable for excessively thin-walled angular cells, between every five or six of which the spiniform tubuli, which are smaller than in any other species of the genus, and inconspicuously isolated. The groups of large cells, mentioned in the description of the surface characters, are of course, quite distinct in this kind of section.

This species is closely allied to *D. appressa* in its growth and general features. Under the hand glass that species is seen to have somewhat smaller cells, less conspicuous clusters of large cells, and thicker tube-walls. Internally the much smaller spiniform tubuli of *D. paupera* will serve to distinguish them.

Formation and locality: Cincinnati group. Quite rare near the tops of the hills back of Cincinnati, O., where it appears to be restricted to a vertical range of only a few feet, somewhere between 375 and 400 feet above low water mark.

DEKAYIA MULTISPINOSA, n. sp. (Plate VI., figs. 8 and 8a.)

Zoarium dendroid, branches somewhat flattened, from .25 to .6 inch in diameter. Surface not raised into monticules. Cell apertures often covered by a pellicle, upon the surface of which, and over the angles of junction of the cells, the numerous, but comparatively small spiniform tubuli are sharply elevated. Even when the pellicle is absent these spines are very readily detected under a hand glass. At intervals of about .1 of an inch, measuring from center to center, are clus-

ters of cells slightly larger than the average. Between the individual cells composing these groups, there are always a greater or less number of much smaller interstitial (?) cells, which are sometimes aggregated in sufficient numbers to constitute "maculæ." Cells with moderately thin walls, those of the ordinary size about $\frac{1}{180}$ th of an inch in diameter, while that of those in the clusters mentioned does not exceed $\frac{1}{90}$ th of an inch.

In longitudinal sections the tube-walls are seen to differ but slightly in thickness in the axial and peripheral regions. Diaphragms are very sparingly developed, no tube, so far as I have been able to observe, being provided with more than two or three, throughout its length. The spiniform tubuli may be observed in large numbers, with the usual structure. None of the smaller tubes differ in their tabulation from the ordinary ones, and we may therefore assume, with some certainty, that true interstitial tubes are absent. The bending of the tubes from the axial into the peripheral regions is quite uniform and gradual.

Tangential sections show that the ordinary cells have thin walls, those of the slightly larger cells in the clusters described, being somewhat thicker. The spiniform tubuli are somewhat variable in size, and very numerous for a species of *DeKayia*, since nearly every angle of junction between the cells is occupied by one. A variable number of small cells is always present. These are, however, mostly developed between the large cells of the clusters. What their nature is doubtful, but, as before intimated, it is highly probable that they are only young tubes.

The large number of spiniform tubuli will serve to distinguish this species from all the other forms of the genus known to me. In its other characters the species is quite closely allied to *D. aspera*.

Formation and locality: Cincinnati group. Rare at an elevation of about 425 feet above low water mark in the Ohio river, on the hills back of Cincinnati, O.

PETIGOPORA GREGARIA, n. gen. et. sp. (Pl. VII., figs. 3, 3a, 3b and 3c.)
Gen. char. *ante* vol. v., p. 155.

Zoarium consisting of small patches usually from .1 to .3 of an inch in diameter, and .04 inch in thickness, adhering to foreign bodies. Nearly all of my specimens are attached to *Heterotrypa frondosa*, D'Orb. A narrow, usually smooth, but sometimes slightly wrinkled, germinating membrane forms the outer margin, which is

slightly elevated, and developed in advance of the young marginal cells. Surface without monticules, and covered uniformly by the apertures of equal sized cells, twelve or thirteen of which, are ranged in a series .1 of an inch in length. Interstitial cells wanting. Spini-form tubuli may be detected on well preserved examples by viewing the cells obliquely. In all cases, however, they project so little that they are easily overlooked.

Longitudinal sections show that the tubes in the central portion of the zoarium are vertical, those nearer the margin being inclined at an increasing angle. Their walls, when not including one of the large spiniform tubuli, are moderately thin, and often somewhat flexuous. The epithelial membrane is very thin and generally undulated. Diaphragms appear to be wanting.

Tangential sections show that, with the exception of an occasional young tube, the cells are of nearly uniform size and of one kind only. Between the angles of junction, the majority of which are occupied by the comparatively large spiniform tubuli, the walls are thin and appear to be amalgamated, no divisional line being visible between the walls of adjoining cells.

The genus *Petigopora* is established for the reception of at least four, and probably five Lower Silurian species, only one of which, the *Chaetetes petechialis*, of Nicholson, has been heretofore described. Two are now described for the first time, the type species *P. gregaria*, and *P. asperula*. The remaining species I hope to be able to describe at some future time. The principal characters of the genus are: (1), the large and numerous spiniform tubuli; and (2), the limitation of the growth of the colonies to small, individualized patches, which if brought into contact by lateral development, do not fraternize, but either raise a non-poriferous epithelial barrier, or leave a narrow unoccupied space between them. One of the undescribed species occurs in the shale washings of the upper strata of the Cincinnati group, as small subglobular masses, rarely exceeding .1 of an inch in diameter. This peculiarity of growth is due to the fact that the colony invariably selects some minute fragment of a shell or other foreign body, for a nucleus, which is eventually entirely covered. Its spiniform tubuli are numerous, and being of large size they are remarkably prominent, when in a good state of preservation.

Petigopora gregaria is readily distinguished from all the parasitic *Monticuliporidae* of the Cincinnati group, by its non-poriferous, sometimes concentrically striated marginal band, which is always preserved.

and much more distinct than it is in any other species of the genus. From the latter the type species is further separated by its smooth often concave upper surface.

Formation and locality : Cincinnati group. Rather rare on the hills back of Cincinnati, O., at an elevation of 425 feet above the river bed. The range is not positively known, but I found two groups of zoaria nearly 300 feet lower in the series.

PETIGOPORA ASPERULA, n. sp. (Pl. VI., figs. 4, 4a, 4b and 4c.)

Zoarium adhering to foreign objects, such as the shells of *Strophomena alternata*, etc., consisting of thin subcircular expansions, from .2 to .5 of an inch in diameter, and .03 to .08 of an inch in thickness. The surface is studded with small conical elevations, arranged in quite regular intersecting series, six or seven in the length of .4 of an inch. They are occupied by cells but slightly, if at all, larger than those of the ordinary size ; it is usual, however, to find the apices occupied by one or several spiniform tubuli often considerably larger than those in the intervening spaces. Cells small, somewhat unequal in size, from thirteen to fifteen in the length of .1 of an inch. The cell-walls are moderately thin between the angles of junction of the cells, the majority of these being occupied by very large and prominent spiniform tubuli.

Longitudinal sections show numerous spiniform tubuli, the proper tube-walls moderately thin, and no diaphragms. The tubes are at first inclined, but soon bend upward and proceed in a direct line to open at the surface.

In tangential sections the cell walls between the numerous spiniform tubuli, are quite thin, and occasionally preserve in a faint manner the divisional line between adjoining cells. The walls are somewhat thicker, and the spiniform tubuli larger than ordinary, in the groups of cells occupying the monticules at the surface.

This species does not resemble either *P. gregaria*, or *P. petechialis*, very closely, differing from both of those species in having distinct monticules and more conspicuous spiniform tubuli. *P. petechialis* forms very small conical zoaria, never, so far as I have been able to observe, more than .12 of an inch in diameter. Its vertical range is extended, I having collected typical specimens in the Upper Trenton rocks of Kentucky, and at nearly all elevations in the Cincinnati group. The range of *P. asperula* is much less extended, being apparently restricted to the strata between 300 and 450 feet above low water mark in the Ohio river.

Formation and locality: Cincinnati group. Not uncommon on the hills back of Cincinnati, O., and Covington, Ky.

LEPTOTRYPA, n. gen.

Zoaria thin, incrusting foreign bodies, occasionally overgrowing the latter and becoming partially free. Cells polygonal, thin-walled, apparently of one kind only. Surface with monticules or without, usually, however, showing more or less distinct groups of large cells. Spiniform tubuli small, numerous, generally occupying only the angles of junction of the cells. Diaphragms wanting or but sparingly developed.

Type, *L. minima*, n. sp.

This genus includes a group of species that I have found it quite impossible to distribute among the genera of *Monticuliporidae* already established. They can not be placed with *Atactopora*, the species of that genus being provided with spiniform tubuli which are always placed within the substance of the cell-walls, and project prominently into the cell-cavity, so as to give it a petaloid appearance. In *Leptotrypa* they are always situated *between the walls*, and are only rarely developed excepting at the angles of the cells. They have but little affinity with the species of *Spatiopora*, the cell-structure in the two genera being quite different.

Tangential sections of *Leptotrypa* somewhat resemble those of certain species of *Amplexopora*, but they differ so widely in growth, and other respects, that I am forced to regard them as quite distinct. How nearly *Leptotrypa* is allied to *Nebulipora*, McCoy, I am unable to say.

I have in vain tried to gain something like a satisfactory knowledge of the species upon which McCoy founded his genus. Specimens said to be *Nebulipora papillata*, prove, upon investigation, to belong to a species of *Ceramopora*. Even if an examination of McCoy's types, which may no longer be possible, should show the above identification of his species to be erroneous, and my genus a synonym, I ought not to be blamed, for, after carefully considering the question, I have come to the conclusion, that to propose a new genus for the reception of my species, will cause less confusion than to place them into a genus, the characters of which no one seems able to define with any degree of certainty.

Beside the four species next described, I propose to include in the genus *Leptotrypa*, *Chatetes discoideus*, James (Nicholson), and two Niagara group species, which Hall has, erroneously I believe, placed in his genus *Palæschara*, under the names of *P. offula* and *P. maculata*.

A very peculiar group of species, which I shall, provisionally, also include in this genus, is found in the *Monticulipora calceola*, Miller and Dyer, *M. clavacoidea*, James (Nicholson), and an undescribed form. Though I have seen of the first at least a thousand specimens, and of the other two several hundred, I have not detected any evidence going to show that they have grown upon a foreign object. On the contrary, the special form of the central cavity, assumed by each of the three species, is apparently due to the amount of curvature adopted by the tubes in their course from the point of gemmation to their apertures. In *M. calceola* the zoæcial tubes are always quite strongly curved, in consequence of which the zoarium takes a turbinate form, the gradually enlarging internal cavity being enrolled in a plane, and often making nearly two complete volutions. In *M. clavacoidea*, the tubes are straight, and proceed in almost a direct line to the surface. The form of the zoarium is therefore straight. In the undescribed species, which in 1880 I catalogued under the name of *Chætetes concavus*, the tubes curve but slightly, and the resulting form of the zoarium is concavo-convex, the cavity which in *M. calceola* is strongly curved, and straight in *M. clavacoidea*, being represented in *L. (?) concava*, by an oval impression. The internal structure of the cells and tube-walls of these species is, in all respects, very closely like that of *L. ornata*, and as such a structural similarity is of more importance than differences in the mode of growth, I have concluded, provisionally, to unite them with *Leptotrypa*.

LEPTOTRYPA MINIMA, n. sp. (Pl. VI., figs. 2, 2a and 2b.)

Zoarium consisting of very thin expansions adhering parasitically to the shells of a small species of *Orthoceras*, which are usually entirely covered by this delicate bryozoan. The surface shows at intervals of about .08 of an inch, abruptly elevated, small, conical monticules, two or three hundredths of an inch in diameter, and a little less in height. Their arrangement is often quite regular, in longitudinal and transverse or intersecting series. Their slopes are occupied by cells but slightly, if at all, larger than the average, while the summits often carry the apertures of a variable number of much smaller cells, which, if the specimen be worn, may give the monticules a sub-solid appearance. Cells $\frac{1}{180}$ th to $\frac{1}{120}$ th of an inch in diameter, angular, and thin-walled. The spiniform tubuli are to be observed only in well-preserved examples, their position being indicated in such specimens by a slight elevation of the junction angles of the cells, above the general level of the cell-aperture.

In longitudinal sections (Pl. VI., fig. 2*b*), the tubes are seen to be at first somewhat prostrate, but they soon rise and proceed directly to the surface. Their walls are moderately thin, and quite straight. Diaphragms are usually absent, an isolated one is, however, occasionally met with. Excepting the point of size, no difference can be detected between the ordinary tubes and the small ones mentioned in describing the monticules. On account of the filling of the tubes with the surrounding shaly matrix, the minute characters, which under other circumstances would be distinct, are often much obscured, if not obliterated.

Tangential sections (Pl. VI., fig. 2*a*), show that the angles of the cells are somewhat thickened and occupied by a small spiniform tubuli, which, if the section be taken from an inferiorly preserved example, may be overlooked. The cell-walls between the angles are thin, and in the state of preservation accessible to me, show no divisional line, those of adjoining cells being apparently amalgamated with one another. A variable though never large number of small cells, which our present information demands we should regard as either young or aborted, are irregularly interspersed among the ordinary cells, but oftener aggregated between the cells occupying the surface monticules.

All the specimens of this species seen by me, and their number is not less than three hundred, are without an exception, attached to a small species of *Orthoceras*, from two to four inches in length, and from .3 to .6 of an inch in diameter, at the larger end. The small conical monticules, and flat interspaces of *L. minima*, will distinguish it from the other species of the genus, as well as from all the rest of the parasitic *Monticuliporidae* of the Cincinnati group, with the exception, perhaps, of some of the species of *Atactopora*. These are, however, readily distinguished by their spiniferous and inflected cell-walls.

Formation and locality : Cincinnati group. Not uncommon in the shaly beds at Hamilton, Ohio, at an elevation equivalent to 350 feet above low water mark in the Ohio river, at Cincinnati, O. It is rare at the Cincinnati quarries.

LEPTOTRYPA ORNATA, n. sp. (Pl. VI., figs. 4 and 4*a*.)

Zoarium parasitically attached to *Cyrtolites ornatus*, the entire shell of which it covers with a thin expansion, from .02 to .10 of an inch in thickness. Surface smooth, but presenting at intervals of .1 inch, measuring from center to center, groups of cells that are conspicuously

larger than those in the intervening spaces, their diameter often exceeding $\frac{1}{80}$ th of an inch, while that of the ordinary cells is about $\frac{1}{120}$ th of an inch. Cell-walls thin, with the angles of junction slightly elevated.

In longitudinal sections (Pl. VI., fig. 4a) the tubes are thin-walled, and proceed abruptly from the attached epithecal membrane to the upper surface. Diaphragms may be absent or developed in limited numbers. The center of the walls is often traversed lengthwise by a delicate light line, indicating the central cavity of the spiniform tubuli.

Tangential sections (Pl. VI., fig. 4) often show a delicate dark line separating the thin walls of adjoining cells, which at nearly all their angles of junction, is enlarged so as to include a small spiniform tubulus. Both these and longitudinal sections show, that with the exception of the larger cells already described, the cells consist of one kind only.

This is a common species at the top of the hills back of Cincinnati, O., where over nine tenths of the specimens of *Cyrtolites ornatus* found are covered with it. The thin zoarium may sometimes be flaked off, so as to expose the beautifully cancellated shell of that gasteropod.

Formation and locality: Cincinnati group. At Cincinnati, O., and other localities where the strata marking the 420 ft. level above the Ohio river are exposed.

LEPTOTRYPA CLAVIS, n. sp. (Pl. VI., figs. 3 and 3a.)

Zoarium growing parasitically, usually upon crinoid columns, but not infrequently upon the stems of small branching bryozoa. In thickness it varies from .02 to .15 of an inch, the largest specimen seen being about one inch in length. Those growing upon the crinoid columns usually become club-shaped or subfusiform, while those on other objects are variously and irregularly shaped. Surface presenting at intervals of .1 inch, small clusters of cells a little larger than the average, which in a few specimens are slightly elevated above the general level of the surface. Cells of one kind only, rather unequal in size, and irregular in arrangement, with moderately thin walls, and an average diameter of $\frac{1}{130}$ th of an inch, while the diameter of those in the groups seldom exceeds $\frac{1}{100}$ th of an inch. When in a good state of preservation the spiniform tubuli are quite prominent and pointed, and being numerous, give the zoarium a characteristically hirsute appearance.

Longitudinal sections (Pl. VI., fig. 3a) show a spiniform tubulus between nearly all of the thin and straight tube-walls. Their internal

cavity is distinctly shown and comparatively large. Diaphragms are usually developed at remote intervals, though often wanting. No interstitial tubes have been observed.

In tangential sections (Pl. VI., fig. 3) the cells are seen to be thin-walled and of rather unequal size. Spiniform tubuli of moderate size are plentifully developed, placed at the cell-angles and often at points between, in which cases the walls are forced into their respective cell-cavities on each side. No special series of small cells are observed in these sections.

This species is probably most nearly allied to *L. ornata*, from which it differs principally in having more numerous spiniform tubuli, which are also much more conspicuous, both externally and internally. These differences will also apply to the other species.

Formation and locality: Cincinnati group. A common species in the lower 200 feet of strata exposed at Cincinnati, O., and elsewhere.

LEPTOTRYPA CORTEX, * n. sp.

Zoarium attached to the shells of *Orthoceras* and *Endoceras*, over which it forms large expansions, from .02 to .08 of an inch in thickness, and several inches in length. Surface smooth, but with distinct clusters of cells, larger than the average, at intervals of .15 of an inch, measuring from center to center. The cells are moderately thin-walled, and quite regularly hexagonal, those of the ordinary size having a diameter of about $\frac{1}{9}$ th of an inch, while that of the largest in the clusters rarely exceeds $\frac{1}{6}$ th of an inch.

Longitudinal sections show that the tube-walls, just above the epithecal membrane, are very thin; nearer the surface they are somewhat thickened, and show the line of demarcation separating the walls of adjoining tubes, and an occasional spiniform tubulus. Diaphragms are quite numerous, those in the upper part of the tube being about one half a tube-diameter apart, which distance is gradually increased in the lower portion to more than one tube-diameter. Interstitial tubes are entirely absent.

Tangential sections show quite distinctly the divisional line between the tubes, while the angles are usually enlarged to admit what I now regard as spiniform tubuli. They are generally represented only by a dark triangular space, but a few also show a minute central lucid spot,

*The figures of this species were unfortunately overlooked in preparing the plates for this number. Being a species of some importance, I was unwilling to strike it out of this connection, proposing to make my description valid by figuring its characters in my next installment.

such as characterizes these structures in other forms. The cell-walls are moderately thin, and as a rule hexagonal, though five and seven sided tubes are not uncommon.

This species is distinguished externally from *L. ornata*, by its larger and more regularly arranged cells. Internally we find a greater number of diaphragms in the tubes of the former, than in those of the latter species.

In many respects *L. cortex* is closely related to such species of *Monotrypa*, as *M. petasiformis*, Nicholson, and *M. filiosa*, D'Orbigny. I am, however, slowly becoming convinced that those species do not really belong to the genus *Monotrypa*. They differ from *M. undulata*, Nicholson, the type of that genus, in several important features. In *M. petasiformis*, for instance, the tubes of the zoarium are divided into two distinct regions, equivalent to the axial and peripheral regions of the ramose *Monticuliporidae*. The tubes in the axial or lower portion of the zoarium have very thin walls, and are crossed by remote diaphragms, which further up in the peripheral region become numerous and often crowded, while at the same time the walls are appreciably thickened, and show a distinct line of demarcation separating adjoining tubes. The structure of *M. undulata* is quite different, its zoarium being, in a measure, homogeneous throughout, and incapable of being divided into similarly differentiated regions. In this connection it is important to note that a number of more or less distinct forms, differing, however, in no essential features from *M. undulata*, occur in Upper Silurian, Devonian, Lower Carboniferous, and Coal measure deposits, a fact going to show, that, though simple in structure, the genus *Monotrypa* is characterized by peculiarities distinct enough to be preserved throughout all the great divisions of the Palæozoic rocks, an extent of range enjoyed by but few of the genera of the *Monticuliporidae*. What to do with *M. petasiformis* and *M. filiosa*, I am not yet prepared to say, being unwilling to admit them into the genus *Leptotrypa*. Their structure being very similar to the most typical species of *Monotrypella*, it might be well to extend the limits of that genus so that they would be included.

Formation and locality: Cincinnati group. Specimens of *L. cortex*, are rather rare in the lower 200 feet of strata exposed at Covington, Ky., and Cincinnati, O.

DISCOTRYPA, n. gen.

Gen. char. *ante* vol. v., p. 155.

The type of this genus, and its only known representative was

described by me in the second volume of this publication, under the name of *Chaetetes elegans*. The zoarium of this species consists of a free and very thin circular expansion, with an average thickness of .02 of an inch, the diameter of the few specimens found varying from .4 to 1.2 of an inch. The under surface is covered by a smooth or concentrically striated, thin epitheca. The upper surface is elevated at intervals of .14 of an inch, measuring from center to center, into low and rounded monticules, the bases of which may be said to be in contact, since the interspaces are concave. Their arrangement is in concentric series around the central monticule, each being occupied by cells which gradually enlarge in diameter from $\frac{1}{16}$ th of an inch at the base to $\frac{1}{60}$ th of an inch at the summit. The cells have thin walls, are rhomboidal or hexagonal in shape, and arranged in regular decussating series, that remind one strongly of the cell-arrangement in *Ptilodictya pavonia*. D'Orb. In longitudinal sections (Pl. VII., fig. 1a) the tubes are seen to proceed to the surface with a slight inclination; the walls are of medium thickness, and show more or less distinctly the original line of demarcation between adjoining tubes. Two or three diaphragms cross each tube, on lines parallel with the upper surface. Tangential sections (Pl. VII., fig. 1b) show that the cell-walls of adjoining tubes are not fused together, the line of separation being quite distinct. On each side of this central line is the original wall, which is usually thickened inwardly, by a thin secondary deposit of sclerenchyma. The cells occupying the monticules are marked by thinner walls, being cut at a deeper level than those in the intervening space. Sections of this species prove that interstitial cells are entirely absent, no young or small cells of any kind having been observed. Spiniform tubuli are also wanting.

Discotrypa elegans is a rare fossil in the Cincinnati group, at an elevation of 300 feet above low water mark in the Ohio river, at the quarries back of Cincinnati, O., and Covington, Ky.

The genus is probably more nearly allied to *Leptotrypa* than to any other genus of the *Monticuliporidae*. They are, however, amply distinguished by the difference in their cell structure, different habits of growth, and the absence of spiniform tubuli in *Discotrypa*.

ASPIDOPORA ARCOLATA, n. gen. et sp. (Pl. VII., figs. 2, 2a, 2b and 2c.)

Gen. char. *ante* vol. v., p. 155.

Zoarium consisting of very thin, convex, free expansions, from .3 to 1.0 of an inch in diameter, and about .025 of an inch in thickness. The under surface is marked with radiating striæ, and sometimes with obscure concentric wrinkles. The upper or celluliferous surface

presents a variable number of slightly convex and irregularly angular spaces with an average diameter of about .15. At the margin of these convex spaces the cell-apertures are circular, and $\frac{1}{110}$ th of an inch in diameter. The cell-apertures gradually become broadly elliptical, and larger as the centers of the spaces are approached, where the largest have a diameter of $\frac{1}{80}$ th inch. The apertures of the cells are often closed by a centrally perforated, thin operculum. The interstitial spaces are occupied by the elongated apertures of very shallow interstitial cells. The spiniform tubuli are quite numerous and prominent.

In longitudinal sections (Pl. VII., fig. 2c) the proper tubes are prostrate for half their length, when they bend upward and proceed directly to the surface. Their walls are thin and more or less flexuous, especially upon the concave side of the tube. The interstitial tubes are developed from the upper wall of the prostrate portion of the proper zoecia, and enlarge very rapidly, so as to attain their full size, at the second diaphragm. In the proper tubes the diaphragms are present only in the lower half of the tube, where it is crossed by two or three. At their apertures a very thin calcareous line representing the opercula mentioned may sometimes be detected. In the interstitial tubes the diaphragms are crowded. The spiniform tubuli are first developed near the cell-apertures, where if carefully looked for, a variable number may be detected. A second layer of cells is often found above the first.

Tangential sections (Pl. VII., fig. 2b) show that the cells have very thin walls, those of adjacent tubes being entirely separated, or in contact only at limited points. Their diameter becomes greater as the center of the convex spaces or monticules is approached, while they at the same time vary their shape from sub-circular to oval or elliptical. The interstitial spaces are occupied by large, usually hour-glass-shaped interstitial cells, which are occasionally divided into halves by a very faint wall. Comparatively large spiniform tubuli are developed at all the points where the true cells come in contact.

This species in growth somewhat resembles *Prasopora* (?) *newberryi*, Nicholson, and the closely allied *P. calycula*, James (*Diplotrypa calycula*, Nicholson). Both those, however, have a smooth, and evenly convex upper surface, while the under surface is only concentrically, and not radially striated.

Formation and locality: Rare in the shales just above low water mark in the Ohio river at Cincinnati, O. My specimens were collected on the banks of the river Ohio, in the first ward of the city.

SPATIOPORA ASPERA, n. gen. et. sp. (Pl. VII., figs. 5, 5a and 5b.)

Gen. char. *ante* vol. v., p. 155.

Zoarium parasitically attached to the shells of *Orthoceras*, over which it forms large, but very thin expansions, never, so far as observed, exceeding .05 of an inch in thickness. Cells oblong, of very irregular shapes, more or less unequal in size, with an average diameter of $\frac{1}{15}$ th of an inch. At intervals of about .15 of an inch the surface exhibits clusters of larger cells, some of which may attain a diameter of $\frac{1}{10}$ th of an inch. These groups are not so conspicuous on account of their size, as for the aggregation of the remarkably developed spiniform tubuli, which, being also distributed between the ordinary cells, give the entire surface a very rough appearance. The cell-walls when not enlarged by the spiniform tubuli are thin.

Longitudinal sections (Pl. VII., fig. 5b) are remarkable for the very unequal thickness of the cell-interspaces. This peculiarity is due to the fact that on one side of the tube the divisional wall is simple and thin, while on the other side it may be much thickened by one of the spiniform tubuli. Diaphragms appear to be wanting.

In tangential sections (Pl. VII., fig. 5a) the cell-walls are of variable thickness, and traversed by peculiar interrupted, dark streaks, that give these sections a marked resemblance to similar sections of the Lower Silurian *Ceramoporidæ*. The walls of adjoining tubes are apparently fused with one another. The cell-cavities are irregularly shaped, and often indented by an inflexion of the wall.

The genus *Spatiopora* is established to receive seven Lower Silurian species. Four of these are now described for the first time, the fifth was described and figured by Edwards and Haime in 1850, under the name of *Chatetes tuberculatus*, the sixth is about to be published by Mr. Arthur Foord in the next publication of the Canadian Survey; while the seventh must for a time remain unpublished. The affinities of the genus are directly intermediate between the *Ceramoporidæ* and *Monticuliporidæ*, the external appearance of the cells and zoarium in general being like that of other parasitic genera of the latter, while the internal structure of the walls is precisely like that of the most typical species of the former family. To decide to which of these two families the genus most properly belongs, can not, at this time, be done with any certainty, and as I have not yet figured any of the *Ceramoporidæ*, I will postpone my comparisons, until I shall have done so.

S. aspera, the type of the genus, is easily distinguished from this species by its rough surface.

Formation and locality: Cincinnati group. Comparatively rare at

Hamilton and Cincinnati, O., at an elevation of about 375 feet above low water mark in the Ohio river.

SPATIOPIORA MACULOSA, n. sp. (Pl. VII., fig. 6.)

Zoarium forming large and very thin parasitic expansions, usually adhering to the shells of *Orthoceras*, but in a few instances to other objects. The surface shows at intervals of .18 inches, measuring from center to center, distinct groups of large cells, which, very rarely, however, are slightly elevated above the general level of the surface. The diameter of the cells in these clusters not infrequently exceeds $\frac{1}{55}$ th of an inch, while that of the ordinary cells averages about $\frac{1}{110}$ th of an inch. The cell-walls are moderately thin, and at many of the angles are elevated into more or less prominent spiniform tubuli, which are larger and somewhat more numerous among the cells of the clusters mentioned. The cell-apertures are more or less irregular in shape, and never, on account of the thickened wall angles, are strictly angular. Interstitial cells are entirely absent. The internal structure shows no striking peculiarities, and much resembles that of the type species.

This species is not uncommon in the Cincinnati Group. It is distinguished from *S. aspera* by the more distinct groups of larger cells, smaller and less prominent spiniform tubuli, which are only to be observed in finely preserved examples, the greater number of specimens found being entirely smooth.

Formation and locality: To be found at most localities in the Cincinnati group, but it can not be said to be common at any.

SPATIOPIORA LINEATA, n. sp. (Pl. VII., fig. 7.)

Zoarium consisting of excessively thin expansions, adhering to the shells of *Orthoceras*. Cells rounded, or oblong, arranged in regular longitudinal series, and in somewhat less regular transverse or intersecting rows. There are no monticules nor distinct groups of larger cells; the cell-walls between the slightly elevated intersections are quite thin; measuring along one of the longitudinal series nine or ten cells may be counted in the space of .1 inch. On account of the extreme tenuity of the zoarium, the sections prepared of this species are unsatisfactory.

This species is readily separated from the other non-tuberculated species of the genus by the regular arrangement of its cells in longitudinal series. From *S. tuberculata*, Edwards & Haime, sp., which sometimes assumes a similar cell arrangement, it is distinguished by its smooth surface, the zoarium of that species being elevated at intervals into rather large monticules.

Formation and locality : Cincinnati Group. Rather near the tops of the hills back of Cincinnati, O., and at Hamilton, O.

SPATIOPERA MONTIFERA, n. sp. (Pl. VI., figs. 1 and 1a, and Pl. VII., fig. 8.)

Zoarium parasitically attached to the shells of *Orthoceras*, over which it forms a thin and expanded crust ; from .02 to .05 of an inch in thickness. Surface exhibiting a number of long, narrow monticules, all drawn out in one direction, and arranged in more or less regular longitudinal and diagonally intersecting series. The long diameter of these monticules varies from .17 to .35 of an inch, their width rarely exceeding .1 of an inch, their height varying from .05 to .1 of an inch. Four or five may be counted in the length of 1 inch. The cells over all portions of the surface are subequal, moderately thin walled, sub-angular, with an average diameter of $\frac{1}{10}$ th of an inch. A variable number of minute cells is usually placed among the cells occupying the monticules.

Tangential sections (Pl. VI., fig. 1) are remarkable for the peculiar wall structure, already noticed in *S. aspera*. But in this species the light and dark shades of the wall contrast so strongly, and are so intermingled that in some places the walls have a spongy appearance. A few spiniform tubuli were observed. Longitudinal sections (Pl. VI., fig. 1a) show that an occasional diaphragm is present. A few irregularly constricted, small or interstitial tubes may be noticed, in which the diaphragms are numerous.

I have little doubt that when Dr. Nicholson wrote the description of *Chatetes corticans*, which he now regards as identical with Edwards and Haines' *Chatetes tuberculatus*, he had before him three different species, of which *S. montifera* was one. The other two were typical *Chatetes tuberculatus*, and the form which was described by me in this JOURNAL as *Atactopora maculata*. As, however, Dr. Nicholson has abandoned his name *C. corticans*, I have deemed it more advisable to give this form a new name than to re-establish an abandoned one. *S. montifera* is distinguished from *S. tuberculata*, Ed. & H., as well as from all the parasitic bryozoa of the Cincinnati group, by its remarkably developed monticules.

Formation and locality : Cincinnati group; rather rare in the upper layers of the Cincinnati group, at Clarksville, Oxford, and other localities in Southwestern Ohio. It is not found at Cincinnati or any equivalent localities.

[TO BE CONTINUED.]

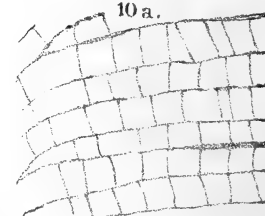
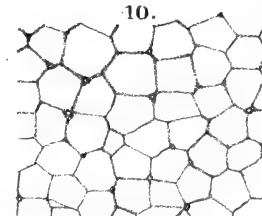
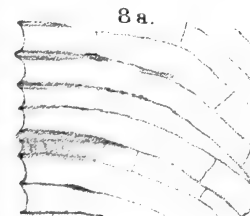
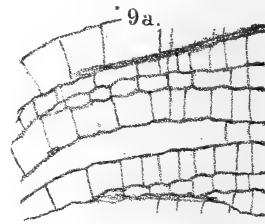
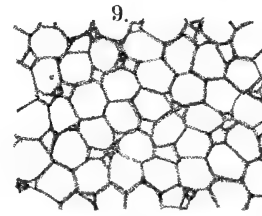
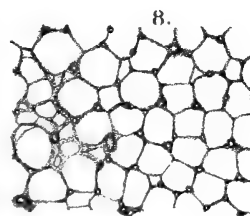
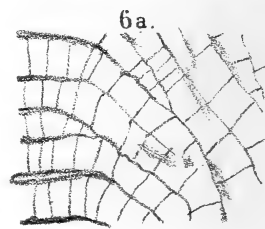
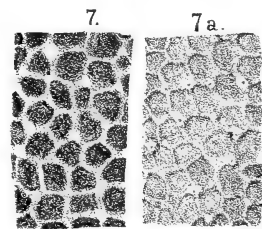
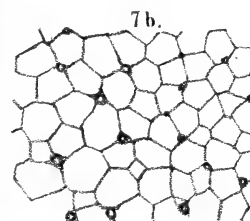
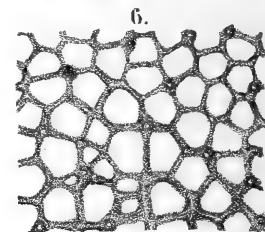
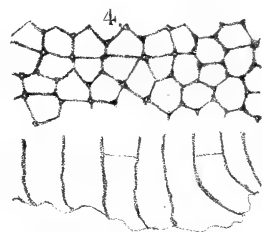
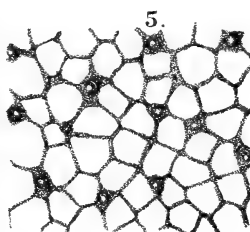
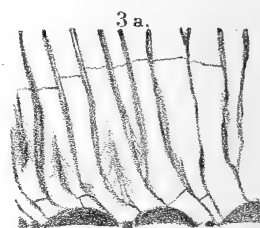
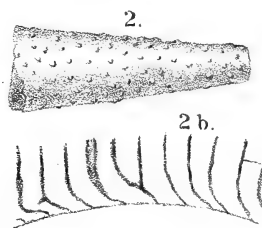
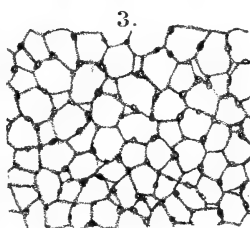
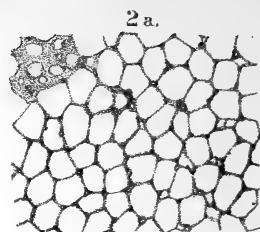
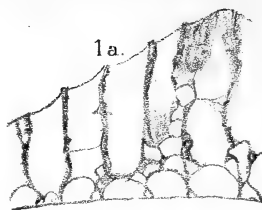
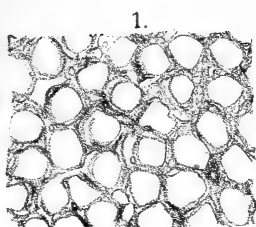


PLATE VI.

All the figures excepting fig. 2, are enlarged to 18 diameters.

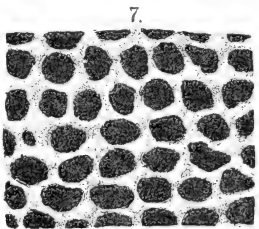
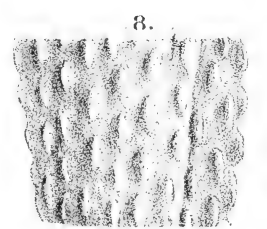
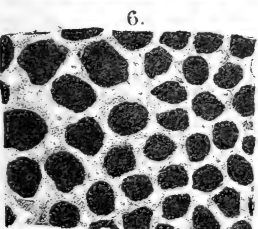
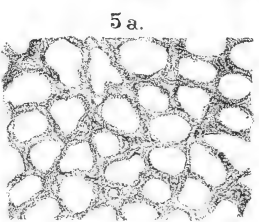
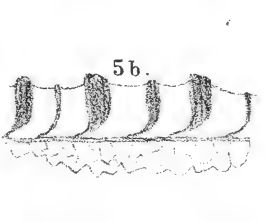
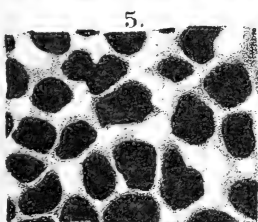
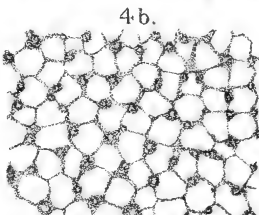
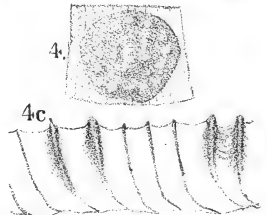
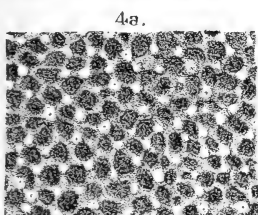
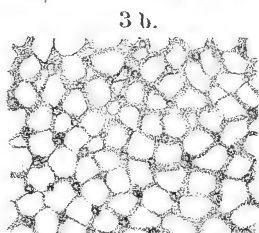
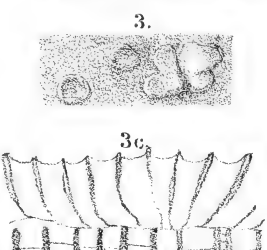
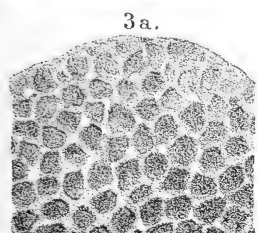
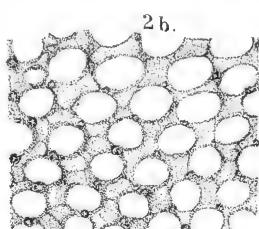
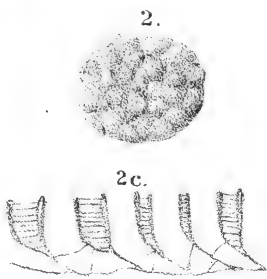
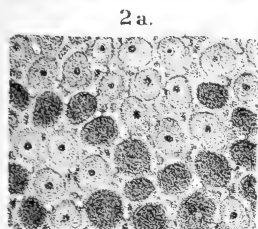
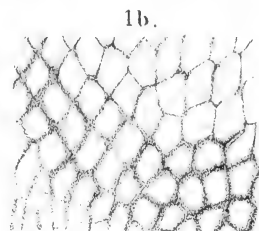
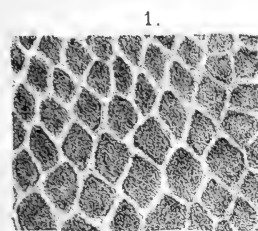
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THE JOURNAL
OF THE
CINCINNATI SOCIETY OF NATURAL HISTORY.

VOL. VI. CINCINNATI, OCTOBER, 1883. No. 3.

PROCEEDINGS OF THE SOCIETY.

TUESDAY EVENING, *July 3, 1883.*

No meeting. Donations were received during the preceding month as follows: From Charles Dury, 5 species of shells from Italy, viz.: *Helix aspera*, *H. vermiculata*, *Cyclostoma elegans*, *Clausilia* — sp? *Arca* — sp? from Rudolph F. Balke, 3 specimens of Reptiles; 1 Scorpion; 1 Double Peach in Alcohol; from Signal Service Bureau, Monthly Weather Review for April, 1883; 3 Volumes of Report of Signal Service Officer, 1880, 1881 and 1883; Memoir on the Use of Homing Pigeons; from the Smithsonian Institution, Vols. 22, 23, 24, 25, 26, 27, Miscellaneous Collections; from the Bureau of Education, Washington, Circular of Information, No. 1, 1883; from the Department of the Interior, First and Second Reports of the U.S. Geological Survey; from Boston Zoological Society, Quarterly Journal, July, 1883.

TUESDAY EVENING, *August 7, 1883.*

President Hunt in the chair. Eleven members present.

Mr. Joseph F. James read a paper on the "Position of the Compositæ in the Natural System." After noticing the fact that the Polypetalæ have been generally recognized as the most highly organized of all plants, he went on to compare the Gamopetalæ with the Polypetalæ. In the family Compositæ we find the most highly organized type of plants. The family is the most dominant one, and the largest in the world. The flowers, being crowded into a head on a common receptacle, are more conspicuous, and more easily visited by insects than if each was separate. The five petals having become united to form the five-lobed tubular corolla, has effected a saving of material for the plant. The calyx of ordinary flowers being reduced to pappus is another saving. The anthers are united into a tube, into which the pollen is shed, and thus a waste is prevented. The pistil, maturing after the anthers, is protruded from between them, and only expands when the pollen can not be of use in fertilizing it, thus being assured of cross-fertilization and the ability to produce better seed. The abortive ray flowers are of use in making the

flower more conspicuous and attracting insects to it. It was, therefore, considered that the Compositæ, as a family, stood at the head of the Vegetable Kingdom, and that the Gamopetalæ were more highly specialized than the Polypetalæ. The paper also gave some ideas as to the heads of the Polypetalæ and the Monocotyledons. The Leguminosæ were considered as the highest type of the Polypetalæ, and the Orchideæ as the highest development of the Monocotyledons. A genealogical tree was given of the Monocotyledons, and the four families of Orchideæ, Liliaceæ, Palmæ and Gramineæ were considered as the heads of the four lines along which the Endogenous plants had developed. The impossibility of making a lineal arrangement of the orders of plants was pointed out and insisted on, and the only natural system that could be formed was considered to be that of placing the plants in a series of parallel lines along which they had developed.

Mr. R. M. Moore read a paper on "The Connection Between the Present Astronomical Conditions and the Phenomena of Earthquakes, Volcanic Eruptions, Tornadoes and Storms, now so Prevalent." He said that all the exterior planets were now in perihelion, a condition which had not occurred for 3,738 years, and that this caused an increased strain upon the earth's crust, which would give way at the weakest place and bring about such convulsions as the recent earthquake on the island of Ischia. This disturbed condition of earth and atmosphere would probably continue for some time.

The two papers were referred to the Publishing Committee.

Mr. R. B. Moore announced that since the last meeting of the Society two of its ex-Presidents had died, Dr. John A. Warder, on the 14th of July, and Mr. V. T. Chambers, on the 2d of August. The Society had also lost a friend in Mr. C. B. Dyer.

Dr. R. M. Byrnes moved that committees be appointed to prepare memorials on these gentlemen for publication.

The Chair appointed the following committees:

On Dr. J. A. Warder—R. B. Moore, Dr. A. E. Heighway, Dr. A. J. Howe.

On Mr. V. T. Chambers—Prof. J. W. Hall, Jr., Charles Dury, Davis L. James.

On Mr. C. B. Dyer—Dr. R. M. Byrnes, L. S. Cotton, Dr. F. W. Langdon.

A letter from Mr. L. M. Hosea, accompanying a donation of a large *Pyrula*, from a mound in Tennessee, was read.

Mr. D. L. James called attention to a specimen of *Astragalus cooperi*, which had been collected recently by Dr. R. M. Byrnes, and which was shown among the donations on the table. The plant had not been observed by botanists of late years, though noted in the List of the Plants of Cincinnati by Mr. Thomas Lea.

Dr. A. J. Howe made a few remarks upon specimens of Acid Phosphate from South Carolina, and of Lignite from Dakota.

Mr. A. F. Gray, of Danversport, Mass., was elected corresponding member, and Messrs. T. H. Aldrich and W. J. Martin, regular members.

Donations were received as follows: From Smithsonian Institution, 6 signatures Proceedings of the U. S. National Museum; from Prof. O. T. Mason, 3 pamphlets on Anthropology; from U. S. Fish Commissioner, 5 signatures Bulletin U. S. Fish Commission; from C. M. Langdon, specimen of saltpeter from England; from Dr. Robert Fletcher, pamphlet, Human Proportion in Art and Anthropometry; 1 pamphlet, A Study of Some Recent Experiments on Serpent Venom; from Dr. R. M. Byrnes, two specimens of *Astragalus cooperi*; from Joseph F. James, specimens of the fruit of *Æsculus pavia*; 1 specimen *Goniabasis*, from Tennessee; from Chauncey M. Depew, 1 pamphlet, Liberty of the Press; from Brooklyn Library, Bulletin of Books, September, 1882, to March, 1883; from the Bureau of Education, Circular of Information, No. 2; from Signal Service Bureau, Monthly Weather Review, May, 1883; from Prof. J. W. Hall, Jr., Report of Explorations and Surveys for a Ship Canal Through the Isthmus of Darien; from Dr. A. J. Howe, Nest of Tarantula; specimens of Lignite and Fossil Wood from Dakota; *Mytilis* and Barnacles from Pacific Ocean; from Prof. F. W. Putnam, 1 pamphlet, Iron from the Ohio Mounds; from Joel Brown, Mt. Healthy, Ohio, Slate Indian Relic; from P. B. Warner, Ashland, Ky., 1 Tree Frog; from Mrs. Dr. Carson, specimen Iron Pyrites from Colorado; from L. Dressel, 2 specimens Beetles from Saxony; from Major L. M. Hosea, specimen of *Pyrula*, from a Mound in Lincoln County, Tenn.; from Davis L. James, 1 specimen *Polyporus reniformis*, Morg.; from R. M. White, Atlanta, Ga., specimens from Phosphate Beds of South Carolina.

TUESDAY EVENING, *September 4, 1883.*

Dr. J. H. Hunt in the chair. Seventeen members present.

Dr. J. Mickleborough read a paper on the "Locomotive Organs of the Trilobite," prefacing his reading with a sketch of the anatomy of the Class Crustacea. The paper was referred to the Publishing Committee.

Mr. Davis L. James exhibited a specimen of *Chara coronata*, found growing spontaneously in a tub of water lilies near Loveland, Ohio, and spoke for a few minutes on the structure of the Characeæ.

Mr. J. F. James showed a specimen of *Hibiscus militaris*, a rare plant in the vicinity of Cincinnati.

Lt. J. J. O'Connell, U. S. A., and G. Holterhoff, Jr., of San Diego, California, were elected corresponding members.

The report of the committee to prepare a memorial upon Dr. John A. Warder was received and read by the Secretary. It was referred to the Publishing Committee for publication.

The committee on Mr. V. T. Chambers reported as follows:

GENTLEMEN OF THE CINCINNATI SOCIETY OF NATURAL HISTORY: The committee appointed by you to prepare suitable resolutions in regard to the death of Mr. V. T. Chambers, beg leave to present the following:

WHEREAS, The death of Vactor T. Chambers, which has been recently announced, has suddenly closed a bright and pure life, therefore we, his fellow-associates and members, desirous of giving expression to our sentiments of high regard, do hereby adopt the following resolutions:

Resolved, That we share in the general sorrow of the community at the loss of a useful man and a good citizen.

Resolved, That we recognized in him one of our most brilliant members, and look back with no common pride and satisfaction, not only upon his intellectual culture and scholarly taste, but his modesty of demeanor and purity of character.

Resolved, That we deeply sympathize with his bereaved family, to which his loss is irreparable, for it was in the home circle that his virtues were most conspicuous.

Resolved, That a copy of these resolutions be forwarded to the family, which express our appreciation of the deceased as an able scientist, devoted husband and father, and of whom it can truly be said, "Here is a man."

J. W. HALL, Jr.,
DAVIS L. JAMES,
CHARLES DURY, } Committee.

On motion, the resolutions were unanimously adopted and the committee discharged.

Dr. F. W. Langdon, of the committee to report on Mr. C. B. Dyer, said that a memorial of Mr. Dyer had been prepared, and was in the hands of the printer for publication in the Society's Journal.

Donations were announced as follows: From William R. Lazenby, First Annual Report of Ohio Experimental Station; from Joseph F. James, Iowa Weather Reports for 1878, 1881, 1883; specimens of *Tebennophorus carolinensis* and *Planorbis complanatus*; from Dr. George Vasey, The Grasses of the United States; from Minnesota Academy of Sciences, Bulletin of the Academy, Health Reports and Geological Survey of Hennepin county; from Chicago Academy of Sciences, Annual Address, 1878; Sketch of Academy, 1877; Catalogue of Florida Shells, and Notes on North American Crustacea, by William Stimpson; from American Academy of Arts and Sciences, Vols. i., ii., iii. and iv. of Proceedings; from Signal Service Bureau, Weather Review and International Scientific Co-operation; from Entomological Society of Ontario, Index to thirteen Annual Reports; from George F. Kunz, 8 specimens of Minerals; from S. T. Carley, specimens of *Glyptocrinus* and *Cyclonema*; from Mr. H. A. Johnston, specimen of Horned Toad; from A. B. Carnahan, 3 specimens of Indian Relics; from John E. Younglove, 4 Geodes; 3 species of Fossils; specimens of Wampum; from Smithsonian Institution, Annual Report for 1881; from Prof. John Collett, Twelfth Annual Report of State Geologist of Indiana; from Mrs. S. A. Brown, lot of Minerals, etc., from Colorado and New Mexico; from Hon. M. McGehee, Curtis' Catalogue of Plants of North Carolina; from L. Dressel, specimen of Green Snake; from John R. Proctor, Vol. v. Kentucky Geological Survey, and pamphlet by Lucien Carr on Mounds of the Mississippi Valley; from T. H. Aldrich, 3 species of Shells.

THE MYCOLOGIC FLORA OF THE MIAMI VALLEY, O.

By A. P. MORGAN.

[*Continued from p. 117.*]

GENUS II.—*COPRINUS*, Pers.

Lamellæ membranaceous, at first pressed together and coherent, easily split, at length dissolving into a black fluid. Trama obsolete. Spores black.

TRIBE I. *PELLICULOSI*.—Pileus fleshy or membranaceous, not splitting along the back of the lamellæ, but becoming torn and revolute.

A. Stipe annulate.

a. Pileus covered with broad scales, 1-3.

b. Pileus covered with minute scales, 4-6.

B. Stipe not annulate.

c. Pileus floccose, tomentose or villous, 7.

d. Pileus strewn with sparkling atoms, 8-10.

A. *Stipe annulate.*

a. *Pileus covered with broad scales.*

1. *C. COMATUS*, Fl. D.—Pileus somewhat fleshy, cylindric, then expanded, even, soon torn into broad, scattered, appressed scales. Stipe hollow, fibrillose; the bulb solid, rooting; the annulus movable. Lamellæ free, linear, at first white, then changing to purple, finally black. Spores somewhat oblique, apiculate, very large .015×.008 mm.

On rich soil in pastures and grassy grounds. Solitary or gregarious; pileus 2-4 in. high and 1½-3 in. in diameter; stipe 6-12 in. in height, and ½-¾ in. thick. The largest and most showy of the genus. Pileus sordid whitish or verging into lilac, in the larger specimens densely shaggy with the broad fibrillose cinereous or brownish scales. Stipe white or pinkish; the annulus sometimes volucreous and persistent at the base of the stipe, sometimes clinging at various heights upon the stipe or dropping off. Lamellæ beautifully variegated with pink and brown and black. Finally the whole pileus becomes a revolute, torn and fragmentary dripping mass of black inky fluid and spores, staining the stipe and herbage.

2. *C. SQUAMOSUS*, n. sp.—Pileus somewhat membranaceous, ovoid then expanded, cinereous, covered with reddish-brown scales. Stipe

hollow, rather equal, below the annulus covered with reddish-brown scales like those of the pileus, above the annulus smooth and white. Lamellæ free, ventricose, white then reddish-brown, finally black. Spores cymbiform, .008—.009 mm. in length. (See Plate VIII.)

Growing about old stumps and trees in woods. Cæspitose; pileus about 1 in. in height, expanding to a diameter of $1\frac{1}{2}$ - $2\frac{1}{2}$ in., then split and revolute; stipe 4-6 in. long, about $\frac{1}{4}$ th of an inch in thickness. This species is readily distinguished by its persistent reddish-brown scales upon the pileus and lower part of the stipe.

3. *C. VARIEGATUS*, Peck. Pileus fleshy, thin fragile, oblong-ovate then campanulate, obtuse, hygrophanous, pale watery brown when moist, whitish or cream-color when dry, variegated by scales or patches of a superficial ochraceous tomentum; the margin finely striate. Stipe equal, brittle, hollow, white, at first peronate-annulate, then floccose pruinose. Lamellæ lanceolate, free, white then rosy-brown, finally black. Spores somewhat elliptic, $.0083 \times .0056$ mm.

On old logs and on the ground in damp woods. Densely cæspitose; pileus 1-2 in. in diameter, and the same in height, stipe 3-5 in. long, and $\frac{1}{4}$ - $\frac{1}{2}$ an inch thick. When young the whole plant is coated by an abundant superficial floccose tomentum; this soon breaks up into loose scales or patches which peel off in flakes.

b. Pileus covered with minute scales.

4. *C. ATRAMENTARIUS*, Bull.—Pileus somewhat fleshy, ovate-expanded, the vertex spotted with innate scales. Stipe hollow, firm, zonate within; the annulus abrupt, fugacious. Lamellæ free, ventricose, at first white, then purplish-brown, at length blackish. Spores elliptic $.009 \times .005$ mm.

About old stumps and on rich soil along country paths and roads. In dense groups, cæspitose. Pileus $1\frac{1}{2}$ $2\frac{1}{2}$ in. in height, expanding to 3 in. or more; stipe 3-6 in. long, and nearly $\frac{1}{2}$ an inch thick. The young plant obese, cheesy-soft, the pileus rugose-plicate, lacunose and lobed; when fully grown, the pileus even, white-cinereous, with brown scales.

5. *C. FUSCESCENS*, Schæff.—Pileus somewhat membranaceous, ovate-expanded, not polished; the disk a little fleshy, even or rimose, scaly. Stipe hollow, equal, fragile, somewhat fibrillose, scarcely annulate. Lamellæ attached, umber-black. Spores oblique, apiculate, $.010 \times .006$ mm.

Upon trunks of oak, ash, willow. Pileus about 2 in. in diameter

stipe 3 in. long, and $\frac{1}{4}$ of an inch or less in thickness. Smaller than *C. atramentarius*, thinner, at first more nearly equal; the pileus brownish-gray; the disk reddish, not sprinkled with sparkling atoms, but at first somewhat pruinose.

6. *C. INSIGNIS*, Peck.—Pileus campanulate, thin, sulcate-striate to the disk, grayish fawn-color, the smooth disk sometimes cracking into small areas or scales. Stipe hollow, slightly fibrillose, striate, white. Lamellæ ascending crowded. Spores elliptic, rough, $.010 \times .007$ mm.

About the roots of trees in woods. Solitary (?) pileus 2-4 in. in diameter; stipe 4-5 in. long, and $\frac{1}{4}$ in. thick. This species is remarkable for its rough spores. In size and general appearance it bears some resemblance to *C. atramentarius*.

B. Stipe not annulate.

c. Pileus floccose, tomentose or villous.

7. *C. NIVEUS*, Pers.—Pileus somewhat membranaceous, oval then campanulate and explanate, covered with a dense, white, floccose-scaly, somewhat persistent villosity. Stipe hollow, equal, villous, white. Lamellæ somewhat adnate, narrow, becoming black. Spores oval, $.012 \times .010$ mm.

Common on dung-heaps, especially of horse-manure. Pileus $\frac{1}{2}$ -1 in. in diameter, stipe 3-5 in. in height. Margin of the pileus very thin and delicate, at length rolled back. Clearly distinguished by the adnate lamellæ.

d. Pileus strewn with sparkling atoms.

8. *C. MICACEUS*, Bull.—Pileus somewhat membranaceous, oval then campanulate, somewhat repand, striate, tawny-ferruginous, discoid, strewn with glittering fugacious granules, soon naked, rimose-sulcate. Stipe hollow, silky-even, whitish. Lamellæ attached, lanceolate, at first whitish, then brown to the middle, at length becoming black. Spores oblique, apiculate, $.0076 \times .0066$ mm.

Upon the ground and about old stumps; very common from early spring till late in autumn, and even in the mild moist weather of winter. Pileus $\frac{3}{4}$ -1 in. in diameter, expanding to $1\frac{1}{2}$ 2 in.; stipe 2-5 in. high and $\frac{1}{4}$ of an inch or less in thickness. Pileus often more or less irregular from the densely crowded mode of growth, the stipes from mutual pressure often angulate.

9. *C. SEMILANATUS*, Peck.—Pileus somewhat membranaceous, broadly conical, then expanded and strongly revolute, farinaceo-atomaceous,

finely and obscurely rimose-striate, pale grayish-brown. Stipe elongated, fragile, hollow, slightly tapering upward, white, the lower half clothed with loose cottony flocci which rub off easily, the upper half smooth or slightly farinaceous. Lamellæ narrow, close, free. Spores oval or somewhat oblique, apiculate, $.012 \times .010$ mm.

On rich ground and manure. Pileus $\frac{3}{4}$ -1 in. in diameter, expanding to $1\frac{1}{2}$ - $1\frac{3}{4}$ in.; stipe 3-5 in. long, and less than $\frac{1}{4}$ of an inch thick. Gregarious and cæspitose, very fragile.

10. *C. PULCHRIFOLIUS*, Peck.—Pileus membranaceous, conical or campanulate, striate to the small even yellowish disk, cinereous, strewn with minute whitish scales or granules. Stipe slender, fragile, hollow, white. Lamellæ narrow, crowded, free, white then cinnamon-brown. Spores elliptic, brown with a slight rosy tinge, $.0070 \times .0056$ mm.

On the ground among the old leaves in woods. *Solitary*; pileus $\frac{3}{4}$ -1 in. in diameter, and $\frac{3}{4}$ -1 in. in height; stipe 2-3 in. high, and $\frac{1}{4}$ of an inch or less in thickness at the base. This is a very singular and beautiful little plant growing solitary in the woods. According to Prof. Peck it is scarcely a *Coprinus*, because the lamellæ are not deliquescent, but it has no place among either the black or brown-spored *Agarics*, and therefore for the present is placed in the genus *Coprinus*.

TRIBE II.—*VELIFORMES*.—Pileus extremely thin, at length splitting along the back of the lamellæ, plicate-sulcate. Stipe slender, hollow. Lamellæ dissolving into fine lines.

a. Lamellæ free from the stipe.

11. *C. NYCTHEMERUS*, Fr.—Pileus very tender, at first conic-cylindric, furfuraceous-floccose, soon splitting, explanate, radiate-plicate, naked, forked-striate, gray, the disk brown. Stipe flaccid, glabrous. Lamellæ free, narrow, at length remote.

Upon manured land. Pileus, at first $\frac{1}{2}$ of an inch in height; afterward expanding to $\frac{1}{2}$ an inch or more in diameter. Stipe becoming pale.

12. *C. RADIATUS*, Bolt.—Very small. Pileus very tender, clavate then campanulate, cinereous-tomentose, soon splitting, radiate-plicate, yellowish, the disk reddish. Stipe filiform, hyaline, becoming glabrous. Lamellæ free, few, pallid-blackish. Spores $.0076 \times .0050$ mm.

On manure, very common in green houses, in the pots among the

plants. Pileus $\frac{1}{4}$ of an inch or less in breadth, stipe 1-3 in. high. One of the most tender, fugacious, with a flaccid habit.

b. *Lamellæ attached to the stipe or to a distinct collar.*

13. C. *PLICATILIS*, Curt.—Pileus very tender, oval-cylindric then campanulate, soon expanded and splitting, sulcate plicate, nearly glabrous, brown then lavender-cinereous; the disk broad, even, at length depressed, darker. Lamellæ attached to a collar remote from the stipe, gray-blackish.

On the moist earth along paths in fields and woods. Pileus $\frac{1}{2}$ -1 in. broad, the stipe 1-3 in. high. Extremely fugacious, disappearing with the rising sun; pileus at length plane, nearly naked, umbilicate, gray, yellowish-brown in the center; stipe very slender, fragile, smooth, gray, tinged with brown, sometimes white, hollow.

GENUS III.—*BOLBITIUS*, Fr.

Hymenophore somewhat discrete; lamellæ membranaceous, soft, liquescent, pulverulent from the seceding spores. Spores ovate, even, somewhat ferruginous.

1. B. *TITUBANS*, Bull.—Pileus membranaceous, ovate-campanulate, afterward split and explanate, yellow, discoid. Stipe slender, straight, yellowish, shining. Lamellæ slightly attached, pallid then becoming purplish or fleshy-brown. Spores salmon-color, elliptic, .008 \times .004 mm.

On manure in woodlands. Pileus 1-2 in. in diameter, stipe 3-5 in. long. Pileus very delicate and tender at length almost deliquescent. This is the only species that has yet been found in our region; I found it in July, 1882, and have the figure of the only specimen.

GENUS IV.—*CORTINARIUS*, Fr.

Veil cobwebby, discrete from the cuticle of the pileus, superficial. Hymenophore contiguous with the stipe; lamellæ persistent dry, changing color, pulverulent from the slowly seceding spores; trama fibrillose. Spores on white paper somewhat ochraceous.

Fungi terrestrial, putrescent, growing in woods.

Note.—The individuals as well as the species of this vast genus are extremely limited in number in the Miami Valley. I have been able to make scarcely any additions to the very few species enumerated by Mr. Lea. I have figures of a few species as yet undetermined. Specimens are so scarce that it is difficult to meet with the different stages of growth.

A. *Pileus viscid.*

a. Stipe not marginate-bulbous, 1.

b. Stipe marginate-bulbous, 2, 3.

B. *Pileus dry*, 4, 5.A. *Pileus viscid.*a. *Stipe not marginate-bulbous.*

1. C. *VARIUS*, Schæff.—*Pileus* compact, hemispheric-explanate, even, viscid, discoid; the margin glabrous; the flesh white. Stipe solid, short, conic, appressed-flocculose; whitish. Lamellæ emarginate, close, entire, purplish then argillaceous-cinnamon.

In woods, in autumn. *Pileus* 2 in. and beyond in breadth, stipe $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, $\frac{1}{2}$ an inch thick above, 1 in. and beyond below. *Pileus* equal, not plainly virgate, encrusted, ferruginous-tawny, fibrillose-appendiculate around the margin; stipe within at length cinerascens not yellowish.

b. *Stipe marginate-bulbous.*

2. C. *CALOCHROUS*, Weinm.—*Pileus* fleshy, convexo-explanate, glabrous, viscid, unchangeable; the flesh compact, white. Stipe solid, equal, fibrillose, white-yellowish; the bulb with a distinct margin. Lamellæ emarginate, close, serrate, blue-purplish.

In open beech woods. *Pileus* 3-4 in. across; stipe 1-3 in. high, 1 in. thick. *Pileus* commonly tawny, luteous around the margin, often spotted or soiled with dirt; the margin thin, involute, sometimes flexuous, not bent inward. Stipe equal, short, without any bluish color.

3. C. *CÆRULESCENS*, Fr.—*Pileus* fleshy, convex, explanate, viscid. Stipe solid, tapering upward, naked, blue changing to white; the bulb marginate. Lamellæ attached, close, entire, at first pure dark blue.

In hilly woods. *Pileus* $2\frac{1}{2}$ -3 in. broad, stipe 3 in. high. The young plant sometimes all blue; *pileus* commonly argillaceous or brownish-yellow, when dry somewhat fibrillose; the flesh preserves its intense blue color when broken; the lamellæ change to purple and at length to cinnamon; there is scarcely any odor.

B. *Pileus dry.*

4. C. *VIOLACEUS*, Linn.—Dark violaceous. *Pileus* fleshy, obtuse, villous-scaly. Stipe bulbous, spongy, villous, violaceous-cinereous within. Lamellæ attached, broad, thick, distant, darker.

In woods. *Pileus* 4 in. or more in diameter, stipe 4 in. high. Showy, inodorous and all of one color. Lamellæ when young deep violet, almost black.

5. *C. ALBO-VIOACEUS*, Pers.—Pileus fleshy, silky with innate fibrils, at length gibbous, violaceous-whitish. Stipe clavate, somewhat annulate, violaceous, whitish. Lamellæ attached, rather distant, serrulate, at first cinereous-violaceous.

In woods. Pileus 2-3 in. broad, stipe 3-4 in. high. Inodorous, the stipe being violet above and white below the obscure annulus, sometimes appears as if sheathed with a white silky covering; flesh juicy, blue-white.

GENUS V.—PAXILLUS, Fr.

Hymenophore contiguous with the stipe, decurrent. Lamellæ membranaceous, easily split, somewhat branched and anastomosing behind, discrete from the hymenophore and easily separating from it.

a. Pileus entire, the stipe central.

1. *P. FLAVIDUS*, Berk.—Pileus fleshy, plane then depressed, somewhat tomentose; the margin thin, involute, even or somewhat repand. Stipe solid, tough, curved and crooked, tapering downward. Lamellæ long-decurrent, thin, sparingly branched, connected by veins, bright yellow. Spores sordid, somewhat fusiform, $.010 \times .005$ mm.

On hillsides in woods. Pileus 2-3 in. across, stipe $1\frac{1}{2}$ -2 in. long. Pileus reddish, brownish or alutaceous, more or less tomentose and soft to the touch; stipe yellowish or reddish. This is one of Mr. Lea's new species; it is quite common on the wooded bluffs about Cincinnati. It is readily known by its bright yellow decurrent lamellæ.

b. The stipe excentric or lateral.

2. *P. POROSUS*, Berk.—Pileus fleshy, excentric, irregular, somewhat reniform, reddish or yellowish-brown, somewhat tomentose or glabrous. Stipe short excentric or lateral, curved, more or less reticulated by the decurrent pores. Hymenium bright yellow, porous, formed by numerous thin radiating folds which are crossed by other narrower folds so as to form large angular pores. Spores bright yellow.

On the ground in woods. Pileus 2-5 in. in diameter, a half to an inch thick; stipe $1\frac{1}{2}$ in. or less in length. This is a very curious species closely allied to *Boletus*. It is liable at the first glance at the hymenium to be taken for a *Boletus*, but the pores are not easily separable from each other. It has a rather leathery feeling and appearance though quite fleshy. I have not observed the disagreeable odor that Mr. Berkeley speaks of.

3. *P. PANUOIDES*, Fr.—Pileus fleshy, dimidiate, concave, downy

then glabrous, produced behind, sessile or resupinate, sordid luteous. Lamellæ decurrent, close, branched, crisped, luteous. Spores sordid, somewhat oblong, $.0050 \times .0035$ mm.

Growing on a rotten log in a piece of woods near Fairmount, Cincinnati; the specimens grew in the same place from early spring till late in autumn. Pileus 1-2 in. broad and about the same length, more or less lobed about the margin. Although not fitting the description perfectly, yet it comes so near that there does not seem enough difference to make a new species.

GENUS VI.—HYGROPHORUS, Fr.

Hymenophore contiguous with the stipe, and descending unchanged into the trama. Lamellæ with the edge acute; the hymenium changing into a waxy mass. Spores white. Fungi terrestrial.

A. Veil universal, viscid, 1, 2.

B. Veil none, plant fragile.

a. Lamellæ not ventricose, 3, 4.

b. Lamellæ ventricose, 5-7.

A. Veil universal, viscid.

1. *H. LAURÆ*, n. sp.—Pileus fleshy, convex and umbonate, then expanded and depressed, more or less irregular, glutinous, white clouded with a reddish or brownish tinge especially on the disk. Stipe solid, more or less curved or crooked, tapering downward, yellowish-white; the apex scabrous with scaly points. Lamellæ unequally adnate-decurrent, distant, white. Spores pellucid, elliptic, apiculate, $.0083 \times .0055$ mm. (See Plate IX.)

Growing in rich soil among the leaves in hilly woods. Pileus 2-4 in. broad, stipe 2-4 in. long and $\frac{1}{2}$ an inch thick. This is a much larger plant than *H. eburneus*, has a wash of red or brown upon the disk, and is covered with a thick gluten. It is more like *H. cossus*, but has no odor.

2. *H. EBURNEUS*, Bull.—Pure white. Pileus fleshy, convex then plane, even, viscid, the margin soon naked. Stipe stuffed then hollow, unequal, viscid, scabrous at the apex with scaly points. Lamellæ decurrent, distant, straight, firm. Spores $.0056 \times .0043$ mm.

In woods, common. Pileus 2-3 in. broad, shining when dry; stipe at length hollow, various in stature, flexuous in elongated specimens. Odor and taste pleasant

B. Veil none, plant fragile.

a. Lamellæ not ventricose.

3. H. CERACEUS, Wulf.—Fragile. Pileus thin, convexo-plane, obtuse, a little striate, viscid, waxy, shining. Stipe hollow, unequal, waxy, shining. Lamellæ adnate, somewhat decurrent, distant, broad, almost triangular, yellow. Spores .0063×.0046 mm.

In many places in meadows and pastures. Pileus about 1 inch broad, stipe 2-3 in. long. Stipe often flexuous, afterward compressed, of the same color as the pileus at the apex, paler at the base. Lamellæ very broad, $\frac{3}{4}$ of an inch, connected by veins.

4. H. COCCINEUS, Schæff.—Fragile. Pileus thin, convex, obtuse, glabrous, scarlet then expallent. Stipe hollow, compressed, yellowish, scarlet above. Lamellæ adnate, decurrent by a tooth, venose connected, variously colored. Spores .0068×.0040 mm.

In meadows and pastures. Pileus 1-2 in. broad, stipe 1-2 in. long. An elegant plant; pileus unequal, soft, at length yellowish. Lamellæ when mature purple at the base, yellow in the middle, the edge glaucous.

b. Lamellæ ventricose.

5. H. PUNICEUS, Fr.—Fragile. Pileus thin, campanulate, obtuse, expand, even, viscid, scarlet then expallent. Stipe hollow, thick, ventricose, striate, the base white. Lamellæ slightly attached, thick, distant, yellow.

In meadows and pastures. Pileus 2-4 in. in diameter; stipe about 3 in. long, $\frac{1}{2}$ -1 in. thick, attenuated both ways.

6. H. CONICUS, Scop.—Fragile. Pileus somewhat membranaceous, conic, acute, glabrous, often lobed, at length expanded and rimose. Stipe hollow, cylindric, fibrose-striate. Lamellæ attenuate-free, ventricose, thin, rather close. Spores .010×.006 mm.

In wet places in woods. Pileus 1-2 in. high, acutely conic, variously waved and lobed; stipe 3-4 in. long. The whole plant turns black when broken or bruised; its colors are various orange, yellow, scarlet, etc., often blended together.

7. H. CHLOROPHANUS, Fr.—Fragile. Pileus somewhat membranaceous, convex, obtuse, somewhat lobed, striate, viscid. Stipe hollow, equal, even, viscid. Lamellæ attached, ventricose, thin, rather distant, whitish.

Amongst grass and mosses. Pileus about an inch in diameter, commonly bright sulphur-yellow; stipe 2-3 in. long, smooth, viscid when moist, shining when dry, yellow; lamellæ emarginate-free at

first white or yellow. Its external appearance is almost that of *H. ceraceus*.

GENUS VII.—LACTARIUS, Fr.

Hymenophore contiguous with the stipe. Lamellæ unequal, membranaceous-waxy, rather rigid, containing a milky juice, the edge acute. Spores globose, white or sometimes yellowish. Fungi terrestrial.

A. Lamellæ unchanged, milk at first white.

a. Pileus tomentose, 1, 2.

b. Pileus viscid, 3-5.

c. Pileus dry, 6-8.

B. Milk colored from the first, 9.

C. Lamellæ changing color, milk at first white.

d. Pileus viscid, 10, 11.

e. Pileus tomentose, 12.

f. Pileus dry, glabrous, 13-15.

A. *Lamellæ not changing color, milk white.*

a. *Pileus viscid when wet, the margin at first involute and tomentose.*

1. *L. SCROBICULATUS*, Scop. Pileus fleshy, depressed, not zonate, luteous; the margin involute, bearded. Stipe hollow, ample, scrobiculate-spotted. Lamellæ thin, close, whitish; milk white changing to sulphur.

In moist woods. Pileus 3-5 in. broad, stipe 2-3 in. high, and about 1 in. thick. This species is readily recognized by its spotted stipe and the milk of the lamellæ promptly assuming a sulphur hue.

2. *L. CILICIOIDES*, Fr.—Pileus fleshy, soft, depressed, tomentose, not zonate, reddish-buff; the margin fibrillose-woolly. Stipe stuffed, even pruinose, silky, not spotted, pallid. Lamellæ close, somewhat branched, pallid; milk acrid, whitish.

In woods. Pileus 2-4 in. broad, stipe $1\frac{1}{2}$ -2 in. high, and $\frac{1}{2}$ -1 in. thick. The pileus is downy becoming fibrillose on the margin; the flesh is yellowish-white; the milk is sparse with a yellowish tinge.

b. *Pileus viscid when wet, pelliculose, the margin naked.*

3. *L. AFFINIS*, Peck.—Pileus fleshy, viscid, glabrous, depressed, pale ochraceous-yellow. Stipe equal, smooth, stuffed then hollow, concolorous. Lamellæ close, some of them forked, yellowish-white; the milk white acrid. Spores white.

In woods and pastures. Pileus 3-4 in. broad, stipe about 2 in. long,

and 1 in. thick. The specimens I find appear to be nearer Prof. Peck's species than anything else; they are not zonate, and the stipe is commonly spotted.

4. *L. ZONARIUS*, Bull.—Pileus compact, umbilicate, even, viscid, with yellowish zones; the margin involute, naked. Stipe solid, short, elastic, even, yellowish. Lamellæ close, thin, whitish; milk white, acrid. Spores white, minutely echinulate, almost globose, .007 mm. in diameter.

In grassy woods. Pileus 2-3 in. broad, stipe 1½ in. high. Margin of the pileus always declined, and more or less flexuous; the stipe never spotted; the flesh white, unchanged and very compact.

5. *L. TRIVIALIS*, Fr.—Pileus fleshy, depressed, viscid, not zonate, lurid, expallent. Stipe hollow, stout. Lamellæ thin, close, white; the milk acrid, white. Spores white.

In hilly woods. Pileus 4-6 in. broad, stipe 2-4 in. long, and 1 in. thick. The pileus is of a dark color, sometimes with a tinge of flesh-color; the stipe is nearly white.

c. Pileus dry, generally unpolished.

6. *L. PERGAMENUS*, Fr.—White. Pileus fleshy, tough, convex, then plano-depressed, repand, not zonate, rugulose, glabrous. Stipe stuffed glabrous, changing color. Lamellæ adnate, very narrow, horizontal, crowded, branched, white, then straw-color; milk acrid, white.

In woods. Pileus 3-6 in. broad, stipe 1½-3 in. long. Very similar to the next species, but the stipe longer, the pileus thinner and the lamellæ not arcuate.

7. *L. PIPERATUS*, Scop.—White. Pileus compact, umbilicate, then infundibuliform, nearly regular, not zonate, even, glabrous. Stipe solid, thick, very short. Lamellæ decurrent, close, arcuate, then ascending, narrow, dichotomous; milk abundant, acrid white.

In woods. Pileus 3-5 in. in diameter, stipe about 1 in. long. Milk very hot and peppery. Pileus generally quite infundibuliform; stipe very short and thick.

8. *L. VELLEREUS*, Fr.—White. Pileus compact, convex-umbilicate, tomentose, not zonate, the margin reflexed. Stipe solid, thick, pubescent. Lamellæ decurrent, distant, arcuate; milk scarce, white, acrid.

In woods. These three species may all be found together in the same woods; they are thought by some to be merely varieties of one and the same species; they are very much alike in their general appearance.

B. Milk colored from the first.

9. *L. DELICIOSUS*, Linn.—Pileus fleshy, convex, umbilicate, viscid, zonate, glabrous, somewhat orange-color, expallent, the margin glabrous. Stipe stuffed, then hollow, spotted. Lamellæ somewhat decurrent, saffron-color, but expallent and greenish when wounded; the milk aromatic, saffron-red.

In damp woods. Pileus 3-4 in. broad, stipe $1\frac{1}{2}$ -3 in. long. The whole plant abounds with orange milk, and when bruised or old exhibits stains of green.

*C. Lamellæ pallid then changing to a darker color, finally white-pruinose; milk white.**d. Pileus viscid from the first.*

10. *L. CINEREUS*, Peck.—Pileus fleshy, at length expanded, centrally depressed, usually umbilicate, glabrous, viscid, light gray, with the disk sometimes a little darker. Stipe tapering upward, stuffed, concolorous. Lamellæ close white; the milk white acid.

In woods. Pileus $1\frac{1}{2}$ -3 in. broad, stipe 2-4 in. long. This seems to be a larger plant than Prof. Peck's, and I often find the pileus zonate, yet it does not seem to me to differ sufficiently to make a new species.

11. *L. VIETUS*, Fr.—Pileus fleshy, thin, at first somewhat umbonate, viscid, afterward applanate, umbilicate, even, not zonate, when dry finely silky, expallent. Stipe stuffed then hollow, fragile, livid. Lamellæ somewhat decurrent, thin, whitish; milk at first white then changing to gray, tardily acid.

In humid woods. Pileus 2-4 in. broad, stipe 2-3 in. high. A very distinct species, thin, soft, fragile and various in form; the pileus sometimes infundibuliform, flesh-color or livid then gray.

e. Pileus scaly, villous or pruinose.

12. *L. DISTANS*, Peck.—Pileus fleshy, firm, convex or expanded, depressed, pruinose-tomentose, yellowish-tawny. Stipe very short, solid, firm, equal or tapering downward, pruinose, nearly of the color of the pileus. Lamellæ distant, somewhat arcuate, white or yellowish; milk white, mild.

In grassy ground. Pileus 2-4 in. broad, stipe 1-2 in. high. The pileus is sometimes irregular and excentric, and the cuticle often cracks into areas.

f. Pileus polished, glabrous.

13. *L. VOLEMUS*, Fr.—Pileus fleshy, compact, rigid, plano-depressed,

obtuse, dry, glabrous, golden-tawny, at length rimose-rivulose. Stipe solid, hard, thick, pruinose. Lamellæ decurrent, close, white then yellowish; milk abundant, sweet, white.

In woods, common. Pileus 3-4 in. broad, stipe $2\frac{1}{2}$ - $3\frac{1}{2}$ in. long. Stipe irregular, tapering downward; milk sometimes yellowish; lamellæ becoming brownish on being bruised.

14. *L. SUBDULCIS*, Bull.—Pileus fleshy, thin, papillate, at length depressed, even, glabrous, not zonate, dry, reddish. Stipe stuffed then hollow, equal, somewhat pruinose, reddish. Lamellæ adnate, close, paler; milk white, rather mild.

In woods, common. Pileus 2-4 in. broad, stipe $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long. The whole plant is commonly a dark reddish color.

15. *L. CALCEOLUS*, Berk.—Pileus thin, depressed, brown-buff, the margin repand, the epidermis rimose. Stipe short concolorous. Lamella very few, distant, venose-connected, decurrent, white; milk white, mild.

“On the ground in woods, Waynesville,” Lea. Pileus about 3 in. across, stipe “half an inch in height and thickness.” Flesh white. An exceedingly curious species. The pilei in all the specimens found by Mr. Lea were “laterally confluent.”

GENUS VIII.—*RUSSULA*, Pers.

Hymenophore descending unchanged into the vesiculose trama. Lamellæ rigid, fragile, the edge acute. Spores round, often echinulate, white or yellowish. Fungi terrestrial.

A. Margin of the pileus not striate.

a. Lamellæ forked, 1, 2.

b. Lamellæ mixed, 3-5.

B. Margin of the pileus at length striate.

c. Lamellæ unequal, 6, 7.

d. Lamellæ equal, 8-10.

A. *Pileus compact, firm, the margin never striate.*

a. *Lamellæ mostly forked.*

1. *R. FURCATA*, Pers.—Mild, at length bitter. Pileus fleshy, rigid, gibbous plane then depressed and infundibuliform, even, with a silky luster, then becoming glabrous; the margin even, acute. Stipe stout, firm, even, tapering downward, white. Lamellæ adnate-decurrent, rather thick, somewhat distant, forked, white.

In woods, common. Pileus 4-5 in. in diameter, the stipe 3-4 in.

long, and about an inch thick. The pileus is commonly of a greenish hue, but sometimes brownish. The distinguishing feature is the many forked lamellæ. It is considered poisonous.

2. *R. SORDIDA*, Peck.—Pileus firm, convex, centrally depressed, dry, sordid white, sometimes clouded with brown. Stipe equal, solid, concolorous. Lamellæ close, white, some of them forked. Spores globose, .0076 mm. in diameter.

On the ground under beech trees in hilly woods. Pileus 3-5 in. broad, stipe 4-5 in. long, and $\frac{1}{2}$ -1 in. thick. The taste is acrid, and the flesh changes color when bruised, becoming black or bluish-black; the whole plant turns black in drying. In its general appearance it resembles *Lactarius piperatus*, Scop.

b. Lamellæ broadest and rounded at the apex, short and forked, mixed with the others.

3. *R. LACTEA*, Pers.—Mild, milk-white. Pileus fleshy, compact, unpolished then rivulose; the margin straight, thin, obtuse, even. Stipe solid, compact, thick. Lamellæ free, thick, distant, rigid, some of them forked.

On the ground in beech woods. Pileus about 2 in. broad, stipe $1\frac{1}{2}$ -2 in. long, and $1-1\frac{1}{2}$ in. thick. The pileus is at first white, campanulate, dry; afterward it becomes alutaceous-white, a little rimose, convexo-depressed and often excentric; lamellæ at length adnate, very broad, forked at base and apex.

4. *R. VIRESCENS*, Schæff.—Mild. Pileus fleshy, firm, globose then expanded and umbilicate, innate-flocculose or areolate-verrucose; the margin straight, obtuse, even. Stipe spongy-solid, stout, somewhat rivulose, whitish. Lamellæ free, rather crowded, unequal, forked, whitish.

In woods. Pileus 3-4 in. broad, stipe 1-2 in. long. Pileus often unequal, always dry, the cuticle breaking up into areas, of a greenish hue, sometimes tinged with yellow or purple.

5. *R. LEPIDA*, Fr.—Mild. Pileus fleshy, compact, convex, then depressed, unpolished, silky or rimose-scaly, expallent; the margin patent, obtuse, not striate. Stipe solid, compact, even, white or rose-color. Lamellæ rotundate, rather thick, close, many of them forked, white.

In beech woods. Pileus about 3 in. broad, stipe 3 in. long, and 1 in. thick. Pileus rosy-red, the disk becoming whitish.

B. Pileus fleshy, the margin at length commonly striate or sulcate.

c. Lamellæ with short and forked ones intermingled with the longer.

6. *R. INCARNATA*, n. sp.—Mild. Pileus fleshy, firm then very fragile, convexo-umbilicate then expanded and depressed, moist, sordid-flocculose; the margin acute, not striate; the flesh thin, white. Stipe solid, nearly equal, white. Lamellæ adnate, distant, broad, the alternate ones dimidiate or mostly very short, white then pale flesh-color. Spores white, oblique, apiculate, smooth, $.008 \times .0055$ mm.

On the ground under beech trees. July, August. Pileus 3-4 in. in diameter, stipe about 2 in. long, and $\frac{3}{4}$ of an inch thick. The pileus is at first of a sordid color, brownish on the disk. The whole plant when mature takes on a sordid fleshy hue and becomes exceedingly fragile.

7. *R. FÆTENS*, Pers.—Acrid, fetid. Pileus bullate, then expanded and depressed. rigid; the cuticle adnate, viscid; the disk fleshy; the margin broadly membranaceous, at first inflexed, tuberculose-sulcate. Stipe stout, stuffed, then hollow, whitish. Lamellæ attached, very unequal and forked, venose-anastomosing, whitish, at first exuding drops of water.

In woods common. Pileus 4-5 in. in diameter, stipe 3-4 in. long, and about 1 in. thick. Generally rancid and stinking, but sometimes fragrant; pileus of a dirty yellow; lamellæ white or yellowish, sordid when bruised.

d. Lamellæ almost all of the same length and simple.

8. *R. DECOLORANS*, Fr.—Mild. Pileus fleshy, firm, spheric then expanded or depressed, polished; the cuticle thin, expallent; the margin thin, even. Stipe spongy-solid, elongated, cylindric, rugose-striate, white changing to cinereous. Lamellæ attached, forked, thin, close, white then yellowish. Spores white then yellow, $.0083$ mm.

In woods. Pileus 3-4 in. broad, stipe 3-4 in. long. Pileus of a uniform color, orange-red then yellow and expallent; when fully grown the margin is striate.

9. *R. NITIDA*, Pers.—Nauseous, rather fetid. Pileus a little fleshy, becoming rigid, convexo-plane then depressed, shining, discoid; the margin thin, from the first striate and tuberculose; the flesh white. Stipe stuffed, soft, white-pallid. Lamellæ attached and seceding, thin, close, white then yellow, naked, shining. Spores white then yellow.

In woods. Pileus 1-2 in. broad, stipe 1-2 in. long and $\frac{1}{2}$ an inch thick. Rather small, rigid-fragile, often unequal. Pileus commonly

from dilute or sordid purplish becoming yellowish, often plicate-striate to the middle.

10. *R. LUTEA*, Vent.—Mild. Pileus a little firm, plano-depressed; the cuticle viscid, expallent; the flesh white; the margin even. Stipe stuffed then hollow, soft, white. Lamellæ narrow, free, close, venose-connected, egg-yellow. Spores yellow.

In beech woods. Pileus $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, stipe $1-1\frac{1}{2}$ in. long. An elegant plant; pileus from a beautiful yellow becoming pale. The plant I have so referred has the lamellæ at first white and the stipe yellow like the pileus; it may be a new species.

Note.—The *Russulæ* form a very natural assemblage related to *Lactarii*, but differing from them in the absence of the milky juice. But various *Russulæ* exude drops of water, especially in wet weather. The species are quite difficult of determination, particularly on account of their variable colors.

GENUS IX.—*CANTHARELLUS*, Adans.

Hymenophore contiguous with the stipe, descending unchanged into the trama. Lamellæ thick, fleshy-waxy, in the form of folds, somewhat branched, the edge obtuse.

a. Plant egg-yellow.

1. *C. CIBARIUS*, Fr.—Egg-yellow. Pileus fleshy, firm, at first repand, glabrous, at length turbinate. Stipe solid, tapering downward. Lamellæ thick, distant, concolorous. Spores white, oval, $.0076 \times .0050$ mm.

In woods. Pileus 1-3 in. broad, stipe 1-2 in. long, and about $\frac{1}{2}$ an inch thick. This is the famous Chantrelle, esteemed as a delicacy from the most ancient times. It is not common with us; but is occasionally met with along with its not distant relative *Craterellus lateritius*, Berk. The latter is distinguished from the former by the hymenial surface being even or merely wrinkled, not lamellose.

2. *C. MINOR*, Peck.—Pileus fleshy, thin, convex, then expanded and depressed, egg-yellow. Stipe slender, subflexuous, equal, smooth, stuffed or hollow, concolorous. Lamellæ very narrow, distant, sparingly branched, yellowish. Spores white, $.007 \times .004$ mm.

On the ground in open woods. Pileus 1-2 in. broad, stipe 1-2 in. long. My specimens are rather of a brownish yellow. The pileus is much thinner, and the stipe more slender than in *C. cibarius*; the two are clearly distinguishable.

b. Plant orange or red.

3. *C. AURANTIACUS*, Wulf.—Nearly orange color. Pileus fleshy, soft, depressed, somewhat tomentose. Stipe stuffed, unequal. Lamellæ close, straight, dichotomous, of a rather deeper color. Spores white.

In woods. Pileus 2-3 in. broad, stipe 2 in. long. This species is distinguished by its straight and crowded dark orange lamellæ.

4. *C. CINNABARINUS*, Schw.—Cinnabar-red. Pileus plane, then depressed or somewhat infundibuliform, glabrous; the margin inflexed and more or less irregular. Stipe solid, curved or crooked, unequal, glabrous. Lamellæ rather thick, distant, decurrent. Spores cinnabar-red, oblique, .0083×.0056 mm.

Very abundant in summer. Growing on hillsides in woods. Pileus $\frac{3}{4}$ -1½ in. in diameter, stipe 1-2 in. long. The whole plant together with its spores is a bright cinnabar color. Inside the flesh is white. This beautiful plant was first found in Carolina, by the celebrated De Schweinitz; he says it is common also in Pennsylvania. I am indebted for a copy of the description to Mr. W. C. Stevenson, of the Academy of Sciences, Philadelphia.

GENUS X.—MARASMIUS, Fr.

Fungi tough, dry, marcescent, reviving when wet. Lamellæ tough, the edge acute and entire.

1. *COLLYBIA*.—Pileus fleshy-tough, at length coriaceous; the margin at first involute. Stipe somewhat cartilaginous; the mycelium floccose.

A. Stipe solid or stuffed, villous.

a. Stipe strigose at the base, 1, 2.

b. Stipe naked at the base, 3, 4.

B. Stipe hollow, rooting.

c. Stipe woolly below, glabrous above, 5, 6.

d. Stipe velvety or pruinose, 7, 8.

C. Stipe short, insititious.

e. Stipe glabrous, shining, 9, 10.

f. Stipe velvety or pruinose, 11, 12.

A. *Stipe solid or stuffed, fibrous within, the external cartilaginous cuticle villous.*

a. *Stipe woolly or strigose at the base.*

1. *M. URENS*, Bull.—Acrid. Pileus fleshy then coriaceous, convexo-explanate, glabrous, even, at length wrinkled or rivulose. Stipe

fibrous, solid, rigid, pallescent, mealy with white flocci and white-villous at the base. Lamellæ free, joined together behind, pale or yellowish changing to brownish, at length remote, distant, firm.

In woods on oak trunks and branches and on the leaves. Pileus $\frac{3}{4}$ -1 $\frac{1}{2}$ in. in diameter, stipe 2-3 in. long. Stipe stuffed with crisp fibres, externally covered with subreticulate flocci. Pileus alutaceous or reddish.

2. *M. PERONATUS*, Bolt.—Acrid. Pileus coriaceo-membranaceous, convexo-plane, obtuse, opaque, at length lacunose; the margin striate. Stipe fibrous-stuffed, villous-corticate, yellow then reddish; the base peronate-strigose. Lamellæ attached-seceding, rather thin, somewhat crowded, pallid then reddish.

In woods, among the leaves. Pileus 1-2 $\frac{1}{2}$ in. broad, the stipe 2-3 in. high, and 2 lines thick. Stipe finally hollow and compressed; the villous cuticle seceding when rubbed; the tomentum at the base luteous or white. The younger pileus pale reddish, when fully grown alutaceous.

b. Stipe naked at the base.

3. *M. OREADES*, Bolt.—Somewhat fragrant. Pileus fleshy, tough, convex then plane, somewhat umbonate, glabrous, expallent. Stipe solid, equal; the cuticle villous-interwoven, pallid; the base naked. Lamellæ free, broad, distant, white-pallid.

Growing in circles and series throughout the summer. Pileus $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad, the stipe 2-3 in. long. The pileus when wet reddish or tawny, and the margin striate, when dry cream color. This is the Champignon of Europe. It is not so abundant in this country, but may be observed growing gregariously in rich grassy lands throughout the summer. It withers up in the dry weather, reviving and flourishing with the rains. It is famous for the rich flavor it imparts to soups and gravies. When dried it may be kept for years without losing any of its aroma or goodness.

4. *M. PLANCUS*, Fr.—Mild. Pileus fleshy-tough, plano-depressed, obtuse, even, expallent. Stipe hollow, soon compressed; the cuticle white-villous; the base somewhat tapering, naked. Lamellæ seceding-free, distant, linear, darker.

In woods, rare. Pileus about 1 in. broad, the stipe 2-3 in. long. The pileus somewhat repand, becoming reddish; stipe tough, twisted, compressed above, especially when thickened, pallid. Lamellæ brownish.

B. Stipe rooting, definitely tubular, plainly cartilaginous.

c. Stipe woolly below, glabrous above.

5. *M. PRASIOSMUS*, Fr.—Ill-scented. Pileus somewhat membranaceous, tough, campanulate-convex then explanate, obtuse, rugulose. Stipe hollow; above pallid, glabrous; below thickened, pallid then reddish or brown, somewhat tomentose. Lamellæ attached, rather close, white.

Upon leaves in oak woods. Pileus $\frac{1}{2}$ -1 in. in diameter, the stipe 2-3 in. long and a line thick. The pileus whitish, the disk often darkened, the stipe tough, dilated at the base, incurved and adhering to the leaves; odor alliaceous, strong, persistent.

6. *M. FUSCO-PURPUREUS*, Pers.—Pileus a little fleshy, convexo-plane somewhat umbilicate, expallent. Stipe hollow, glabrous, dark purple; the base reddish-strigose. Lamellæ annulate-attached, at length free, distant, reddish.

In woods among the leaves of beech. Smaller when cæspitose, larger when simple. Pileus $\frac{1}{2}$ -1 in. broad, stipe 1-3 in. long. Pileus dark purple when dry alutaceous.

d. Stipe velvety or pruinose throughout.

7. *M. PYRROCEPHALUS*, Berk.—Pileus a little fleshy, convex then plane, umbilicate, striate-plicate, red-brown. Stipe hollow, densely velvety, brown, pale at the apex. Lamellæ adnate, lax, rather distant, somewhat ventricose, white then pallid.

In woods, growing among leaves and on rotten wood. Pileus $\frac{1}{2}$ -1 in. in diameter, the stipe 2-3 in. long. This is one of Mr. Lea's new species; my specimens agree perfectly except the size, but I judge by the concluding remark in Mr. Berkeley's description, that this is variable.

8. *M. ERYTHROPUS*, Fr.—Pileus a little fleshy, convex then plane, obtuse, even, growing pale, finally rugose. Stipe hollow, striate, glabrous, dark red, somewhat pruinose when dry; the base white-strigose. Lamellæ seceding-free, broad, lax, venose-connected, entire, whitish.

In beech woods, among the leaves and on trunks. Pileus $\frac{1}{2}$ -1 in. broad, stipe $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long. Pileus varying in color, commonly white or pallid. Stipe firm, terete, paler at the apex; finally uniform in color, somewhat compressed, villous inside. Lamellæ loose, crisp, connected by veins.

C. Stipe short, without a root, insititious (i. e. attached at the base by a tubercle or by flocci).

e. Stipe glabrous, shining.

9. *M. CALOPUS*, Pers.—Pileus a little fleshy, tough, convexo-plane or depressed, even, at length rugose. Stipe hollow, equal, glabrous, shining, reddish-brown. Lamellæ emarginate-attached, thin, white.

Growing on sticks, the roots of grasses, etc. Pileus $\frac{3}{4}$ -1 $\frac{1}{2}$ in. in diameter, the stipe 2-3 in. long. The younger pileus even, red-brown, soon changing to white.

10. *M. ANOMALUS*, Peck.—Pileus a little fleshy, tough, convex, even, reddish-gray. Stipe hollow, equal, glabrous, pallid above, red-brown below. Lamellæ rotundate-free, close, narrow, whitish or pallid.

Growing on sticks among leaves in woods. Pileus 1-2 in. broad, stipe 2-3 in. long. This is a very beautiful *Marasmius*; it grows quite large with us.

f. Stipe velvety or pruinose.

11. *M. FAGINEUS*, n. sp.—Pileus a little fleshy, convex then plane or depressed, at length somewhat repand, rugose-striate. Stipe short, hollow, pubescent, thickened upward; the base somewhat tuberculose. Lamellæ short-adnate, somewhat crisped, close, pale-reddish.

Growing thickly over the bark at the base of living beech trees. Pileus $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, stipe $\frac{1}{2}$ -1 in. long. Pileus reddish-pallid or alutaceous, the stipe of the same color, the lamellæ a little paler.

12. *M. OPACUS*, B. & C.—Whitish. Pileus a little fleshy, convex, rugulose, opaque, pulverulent. Stipe pulverulent, furfuraceous below. Lamellæ attached, distant, ventricose.

On leaves and twigs. Pileus 1-2 in. across, stipe 1-1 $\frac{1}{2}$ in. long. The pileus is convex or slightly depressed around a central umbo, and opaque not pellucid, it is dirty white and scarcely striate or sulcate; the stipe is of the same color as the pileus. The species is nearly allied to *M. ramealis*, Bull., but the stipe is more elongated, and is not darker at the base. I am indebted to Mr. Wm. C. Stevenson, of the Philadelphia Academy of Sciences, for the original description.

II. MYCENA.—Pileus somewhat membranaceous; the margin at first straight and appressed. Stipe horny, hollow, tough, dry; the mycelium rhizomorphous.

D. Pileus campanulate or convex.

g. Stipe glabrous, shining, 13.

h. Stipe velvety or mealy, 14, 15.

E. Pileus soon umbilicate, 16, 17.

D. Pileus campanulate or convex.

g. Stipe glabrous, shining.

13. *M. CAMPANULATUS*, Peck.—Pileus membranaceous, convex or campanulate, dry, glabrous, plicate-sulcate, ochraceous-red, the disk a little darker. Stipe horny, hollow, glabrous, shining, blackish-brown. Lamellæ attenuate-attached or nearly free, distant, whitish.

Growing on dead leaves in woods, common throughout the summer. Pileus $\frac{1}{2}$ – $\frac{3}{4}$ ths of an inch in diameter, the stipe 2-3 in. long. This is a very elegant species, flourishing abundantly, and growing quite rank in our rich woods. I find specimens sometimes with a pinkish tint.

h. Stipe velvety or mealy.

14. *M. CLAVÆFORMIS*, Berk.—Pileus submembranaceous, convex tough, white. Stipe tapering downward; below velvety, brown; above white, furfuraceous. Lamellæ long-decurrent, broad in front, distant, whitish inclining to flesh-color.

On dead sticks in woods. Pileus 2 lines broad, stipe 1 in. long. The stipe is attached by a minute bulb. The species is remarkable for its very decurrent lamellæ. It is one of the new species of Lea's catalogue.

15. *M. NIGRIPES*, Schw.—Pileus membranaceous, campanulate, umbonate, striate, somewhat pellucid, pure white. Stipe somewhat bulbous, black, white farinose. Lamellæ adnate, arcuate, rather broad, pure white, growing pale.

Growing among leaves and on the ground in woods. Stipe $1\frac{1}{2}$ in. in length, black but wholly covered over with a white meal which may be easily rubbed off. It is closely related to *M. alliaceus*, Jacq., but is inodorous. I am indebted to Mr. Stevenson for the copy of the original description.

E. Pileus soon umbilicate.

16. *M. ROTULA*, Scop.—Pileus membranaceous, a little convex, um-

bilicate, plicate. Stipe horny, hollow, shining, glabrous, blackish. Lamellæ few, broad, distant, joined behind to a free collar, whitish.

Upon trunks and leaves. Pileus $\frac{1}{2}$ an inch or less in breadth, the stipe 1-2 in. long. Pileus whitish and of a uniform color or the disk darker; the stipe is whitish at the apex.

17. *M. CAPILLARIS*, n. sp.—Pileus membranaceous, convex, umbilicate, sulcate. Stipe capillary, very long, glabrous, shining, black with a pallid apex. Lamellæ adnate to a free collar, equal, numerous, not distant, pallid.

Growing on leaves and sticks. Pileus 1-2 lines in diameter, the stipe 2-2 $\frac{1}{2}$ in. long. The pileus is of a grayish or brownish-pallid color; it is sulcate with 16-20 furrows which correspond to as many lamellæ underneath; the stipe is very long and scarcely thicker than a hair. Its place is between *M. rotula* and *M. graminum*; it differs from the latter in its umbilicate pileus, and from the former in its capillary stipe; it is closely related to both by the free collar.

GENUS XI.—LENTINUS, Fr.

Pileus fleshy-coriaceous, tough, or in the fleshy kinds hardened when mature, persistent. Lamellæ thin, unequal, membranaceous; the edge serrate or lacero-dentate. Spores even, white.

A. Pileus almost entire, the stipe evident.

a. Pileus scaly, 1, 2.

b. Pileus villous, 3, 4.

c. Pileus glabrous, 5-7.

B. Pileus dimidiate, sessile, 8-10.

A. *Pileus almost entire, the stipe evident.*

a. *Pileus scaly.*

1. *L. TIGRINUS*, Bull.—Pileus fleshy-coriaceous, thin, orbicular, umbilicate, whitish; scales innate, hairy, blackish. Stipe slender, not striate, scaly; the apex somewhat veiled. Lamellæ attenuate decurrent, very narrow, white becoming yellowish. Spores elliptic, .0066 \times .0033 mm.

On wood of oak. Pileus about 2 in. broad, stipe 1-2 in. long. Pileus thin, the margin at length split; stipe dirty white. When fresh very tender, when dry coriaceous.

2. *L. SULCATUS*, Berk.—Pileus a little fleshy, at first somewhat conic, at length hemispheric, broken up into scales, silky-virgate, reddish-brown; the margin sulcate. Stipe short, solid, furfuraceous, concolor-

ous. Lamellæ distant, rather broad, thickish, emarginate behind pallid.

Growing out of the cracks in fence rails, in spring. Pileus $\frac{3}{4}$ of an inch or less in breadth, stipe $\frac{3}{4}$ of an inch long. The margin of the pileus is deeply sulcate, with the interstices darker, which gives it a very neat appearance; the stipe is often slightly attenuated downward. This is one of Mr. Lea's discoveries.

b. *Pileus villous.*

3. *L. LECOMTEI*, Fr.—Pileus fleshy-tough, infundibuliform, reflexed, hairy, tawny. Stipe short, hairy. Lamellæ serrate, crowded, pallid.

On logs and stumps. Pileus infundibuliform and more or less irregular, 1-3 in. broad.

4. *L. STRIGOSUS*, Fr.—Pileus fleshy-tough, unequal, somewhat depressed, strigose-hirsute, tawny-reddish. Stipe excentric, strigose-hirsute. Lamellæ decurrent, pallid.

On logs and stumps. Pileus 1-3 in. broad. Very closely related to the preceding species, but differing in the villous stipe, the shorter and more crowded hairs of the pileus and the broader lamellæ irregularly torn.

c. *Pileus glabrous.*

5. *L. OMPHALODES*, B. & C.—Pileus fleshy-tough, thin, infundibuliform, glabrous, whitish. Stipe slender, thickened upward, fibrillose and spongy at the base. Lamellæ entire, narrow, decurrent, white.

On rotten sticks on the ground. Pileus 1-2 $\frac{1}{2}$ in. across, the stipe $\frac{3}{4}$ -1 in. long. Pileus in the larger specimens more or less irregular. This is not the *L. omphalodes*, Fr. My specimens are much larger than those described in the "Notices," but they agree so well otherwise that I could not make a new species. The color is not given by Berkeley & Curtis.

6. *L. CÆSPITOSUS*, B. & C.—Remarkably cæspitose. Pileus plane, tough, alutaceous, clothed with close-pressed, brownish-red fibrils; the margin incurved. Stipe flexuous, tough, striate, grayish-white, fibrillose, solid, formed of fibres. Lamellæ entire, white, long-decurrent.

In woods on the ground. Pileus 1 $\frac{1}{2}$ -2 in. across, the stipe 3 in. high, and 2 lines thick. A very curious species, easily distinguished from its allies by its entire lamellæ.

7. *L. COCHLEATUS*, Pers.—Tough, flaccid. Pileus fleshy, tough, irregular, somewhat lobed or contorted, glabrous, reddish. Stipe solid,

firm, sulcate, glabrous, reddish. Lamellæ close, serrate, fleshy-white. Spores nearly globular, .004 mm. in diameter.

About the base of old stumps. Pileus 1-1½ in. broad, the stipes of variable length. Usually very much tufted with the stipe confluent below.

B. Pileus dimidiate, sessile.

8. *L. URSINUS*, Fr.—Sessile, imbricate. Pilei fleshy-tough, eared-ascending, even, brown-reddish, when mature brown-tomentose below; the margin glabrous, entire. Lamellæ broad, torn, whitish.

Upon rotten trunks of beech. Pileus 1-2 in. long, and about 1 in. wide. Pileus quite thick, at first glabrous, expallent, ear-form.

9. *L. VULPINUS*, Fr.—Sessile, imbricate-multiplex. Pilei fleshy-tough, conchate, connate behind, longitudinally costate-corrugate, floccose-scrupose, alutaceous; the margin incurved, entire. Lamellæ broad, torn, white. Spores nearly globose, .0015 mm. in diameter.

Upon old trunks of elm. Pileus 1-2 in. long, and about an inch broad. The spores abundant, powdering the plants.

10. *L. PELLICULOSUS*, Fr.—Sessile, imbricate. Pileus tough, membranaceous, reniform, very thin, strigose, brown-tawny; the margin naked, involute. Lamellæ broad, torn, pallid.

Upon rotten trunks late in autumn. Pileus 2-4 in. long, and 1-3 in. broad. Pileus strigose with a dense hairy-coat like the skin of some animal.

GENUS XII.—*PANUS*, Fr.

The whole fungus fleshy-coriaceous, tough, drying up; the texture fibrous, radiating into the hymenium. Lamellæ concrete with the hymenophore, unequal, at length coriaceous; the edge wholly entire.

A. Pileus plainly stipitate.

a. Lamellæ decurrent, 1, 2.

b. Lamellæ determinate, 3, 4.

B. Pileus sessile or nearly so, 5, 6.

A. Pileus plainly stipitate.

a. Lamellæ decurrent.

1. *P. CONCHATUS*, Fr.—Pileus fleshy-tough, thin, unequal, excentric and dimidiate, cinnamon then expallent, at length scaly. Stipe short, unequal, pubescent at the base. Lamellæ lineately decurrent, somewhat branched, white-fleshy then ochraceous. Spores white.

On trunks and branches of beech. Pileus 2-4 in. broad, stipe less than an inch in length. Always known by its conchate form and tough substance. It is not hirsute or villous like *Lentinus lecomtei*.

2. *P. DEALBATUS*, Berk.—Pileus coriaceous-soft, flabelliform, sometimes lobed, umber, striate. Stipe lateral, rather long, compressed or channeled, dilated above. Lamellæ decurrent, distinct, umber. Spores white.

On branches of elm. Pileus $\frac{1}{2}$ -1 in. broad, the stipe an inch or less in length. The pileus and stipe when dry are white and minutely cracked, as if whitewashed; a dark border encircles the pileus, and the lamellæ are brown with a white edge. When moist the pileus is tough and pliable, umber-brown and striate. Sometimes the stipe is forked, and each division produces a pileus. There are few prettier fungi than this.

b. Lamellæ determinate.

3. *P. STIPTICTUS*, Bull.—Pileus coriaceous, reniform, cinnamon then expallent; the cuticle seceding into furfuraceous scales. Stipe lateral, short, dilated upward. Lamellæ determinate, thin, close, reticulate-connected, cinnamon. Spores white, .0046 \times .0025 mm.

On stumps, trunks and branches, everywhere, very common, persisting from autumn to spring. Pileus 1-1 $\frac{1}{2}$ in. broad, stipe about $\frac{1}{4}$ of an inch long. Gregarious or cæspitose; pileus semiorbicular, the margin entire or lobed and involute. Taste styptic. This is distinguished from *Polyporus rhipidium* by its different hymenium.

4. *P. FARINACEUS*, Schum.—Pileus somewhat coriaceous, flexuous, cinnamon-umber; the cuticle seceding into a whitish-lavender scurf. Stipe lateral, short, concolorous. Lamellæ determinately free, distinct, rather pale. Spores white.

Upon trunks of hickory. Pileus $\frac{3}{4}$ -1 $\frac{1}{4}$ in. broad, stipe about $\frac{1}{4}$ of an inch long. The pileus is brown or blackish with a dense white pubescence. What I have found grew out of the cracks in the hickory bark.

B. Pileus sessile or nearly so.

5. *P. ANGUSTATUS*, Berk.—Pileus fleshy-coriaceous, thin, spatulate or flabelliform, minutely pubescent, white, dirty white or yellowish. Stipe extremely short or none. Lamellæ very narrow, close, decurrent, white or yellowish. Spores white.

In woods on old logs, common. Pileus $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long by $\frac{1}{2}$ -1 in.

wide above, tapering downward to a narrow nearly sessile base. This and *dealbatus* are two fine new species first discovered by Mr. Lea.

6. *P. DORSALIS*, Bosc.—Pileus fleshy-coriaceous, at first resupinate, afterward expanded, sessile, somewhat reniform, tomentose, luteous, expallent. Lamellæ broad, rather distant, orange-tawny. Spores colored like the lamellæ.

On stumps and trunks. Pileus $1\frac{1}{2}$ -3 in. broad. Often imbricate and sessile or sometimes slightly stipitate. This I have no doubt is the same plant as *Agaricus nidulaus*, Fr. I have observed it carefully in every stage and it agrees perfectly with the figure and description in Fries' *Icones*, except the substance is leathery and persistent, not putrescent.

GENUS XIII.—TROGIA, Fr.

Lamellæ fold-like, crisped, the edge obtuse. Spores white.

1. *T. CRISPA*, Pers.—Tough, cupular-reflexed, lobed, villous, reddish-yellow. Lamellæ fold-like, forked, crisp, whitish or lavender.

Upon branches of beech, etc., rather scarce; late in autumn and during the winter. Pileus $\frac{1}{2}$ -1 in. broad, sometimes whitish in color, sessile.

GENUS XIV.—SCHIZOPHYLLUM, Fr.

Pileus not fleshy, dry. Lamellæ coriaceous, flabelliform-branched, joined above by a tomentose pellicle, bifid, the edge longitudinally split. Spores white.

1. *S. COMMUNE*, Fr.—Pileus adnate behind, somewhat extended, simple and lobed. Lamellæ gray then brown-purplish, the two divisions of the edge spreading or revolute. Spores nearly globose, very small, .0025 mm. in diameter.

Growing upon trunks and branches; very common, in this region, seeming to flourish best in the mild wet weather of winter. Pileus $1\frac{1}{2}$ in. broad, white or gray, tomentose, sessile or with a short lateral stipe; the margin even or variously lobed and split. It grows in all the regions of the earth.

GENUS XV.—LENZITES, Fr.

Pileus corky or coriaceous; the texture dry, floccose. Lamellæ coriaceous, firm, of like texture with the pileus. Spores white.

1. *L. BETULINA*, Linn.—Pileus dimidiate, sessile, persistent, corky-

coriaceous, obsoletely zonate, tomentose, pallid. Lamellæ straight, somewhat branched, anastomosing, sordid white.

On stumps and logs in autumn, persisting till the following spring. Common. Pileus 2-4 in. broad, projecting 1-2 in. Solitary or often much imbricated and confluent; the pileus deeply and concentrically grooved, clothed with dense pubescence or coarse velvety down, grayish, yellowish or brownish, sometimes with distinct colored zones, often green with minute Algæ. Lamellæ at first thick, somewhat porose, sordid; afterward thinner, the edge acute becoming yellowish.

2. *L. VIALIS*, Peck.—Pileus coriaceous, sessile dimidiate, obscurely zonate, somewhat tomentose, brown or grayish-brown, the margin cinereous. Lamellæ thin, abundantly anastomosing, pallid, cinereous-pruinose on the edge.

Very common on railroad ties. Pileus 1-3 in. in breadth, projecting nearly an inch. Often much imbricated and confluent. The plants are commonly much blackened by the grease and dirt of the passing trains. I have a suspicion that this fungus is not different from *Dædalea pallido-fulva*, Berk.

3. *L. SÆPIARIA*, Schæff.—Pileus dimidiate, sessile, coriaceous, hard, zonate, strigose-tomentose, rough, bright-brown; the margin yellowish. Lamellæ rather thick, branched, anastomosing, yellowish.

This plant which properly grows on pine wood, I have only seen on white poplar stumps. Pileus 1-3 in. broad, projecting nearly an inch. Often confluent, deeply zoned; substance coriaceous, fibrous, of a fine ocher or rhubarb color. Hymenium composed of brownish plates, tolerably regular, but here and there slightly branched.

NOTE. — *Lenzites cookei*, Berk., and *L. cratagi*, Berk., which are found in this region, are considered by Prof. Chas. H. Peck to be only forms of the Protean species *Dædalea confragosa*, Bolt. To this opinion, from my own observation, I am willing to subscribe, I have in my possession, of my own collecting, forms representing the three genera, *Lenzites*, *Trametes*, and *Dædalea*.

[TO BE CONTINUED.]

LOCOMOTORY APPENDAGES OF TRILOBITES.

By JOHN MICKLEBOROUGH, Ph. D.

Principal, Cincinnati Normal School.

The discoveries and investigations of paleontologists touching the question of ambulatory and branchigerous appendages of the Trilobites, have been entirely ignored by many of the ablest workers in the science. The important evidence which Mr. Billings produced was unsatisfactory to both Dana and Verrill. In 1881, after many years of untiring labor, Mr. C. D. Walcott (in the "Bulletin of the Museum of Comparative Zoology at Cambridge College") furnished most conclusive proof of the existence of *appendages* to the *cephalic*, *thoracic*, and *abdominal* divisions of Calymene, Cecaurs, and Acidaspis. He says: "the discoveries have been received in about the same manner" as those of Billings and others—with incredulity, and as "having little value."

To confirm the conclusions of these naturalists, who have affirmed the existence of Trilobite legs, and possibly shed some light on the character of the ventral surface of these crustaceans, and thereby aid in the determination of ichnological specimens, is the object of the writer. The conclusions here reached are based upon the work of predecessors, and the specimens of *Asaphus megistos* (Figs. 1 and 3), which were found by Mr. James Pugh (they now belong to Mr. David McCord), two miles north of Oxford, Ohio, in the upper portion of the Hudson River Group.

Although Ch. Mortimer, as early as 1750, and Linnæus, in 1753, had determined the crustacean character of the Trilobites, at least, in zoological affinities, they were placed with *Limulus*, yet more than a century elapsed before any discovery of feet or antennæ was made. In 1864, Mr. Billings discovered the presence of legs in a specimen of *Asaphus platycephalus*, from the Trenton limestones of Canada.

To show the distrust in the minds of naturalists, we quote from the pamphlet of Mr. C. D. Walcott, page 196: "The instances of the discovery of the animal other than the dorsal shell and hypostoma are rare. M. Barrande, in reviewing the reported discoveries made of the appendages of the Trilobites to the date of the publication of his Volume I., 1852, says: 'Unhappily, all the researches have resulted in nothing more than the discovery of the pieces of the mouth named Hypostoma and Epistoma, and the intestinal canal.' Again, in his supplement to Volume I., 1872, he says: 'The few scattered observa-

tions of parts found which might belong to the Trilobites have little value, and were accepted as such by naturalists.'"

In 1872, Dr. A. S. Packard, in his work on the Development of *Limulus polyphemus*, page 185, says: "Though disposed to regard the processes figured by Mr. Billings as feet, still the proof is unsatisfactory. The Trilobites probably had habits similar to those of *Limulus*, and consequently they must have had ambulatory feet, rather than phyllopodal feet, attached to the middle segments of the body. In view of the conflict of opinions as to the nature of the limbs of the Trilobites, it is to be hoped that the matter will not be suffered to rest here by paleontologists, even if the most unique and valuable specimens have to be sacrificed in making the requisite observations."

In 1874, Mr. S. A. Miller figured and described, in the Quarterly Journal of Science, an ichnolite which he regarded as the track of *Asaphus*. In 1880, he reviewed the work of 1874, and figured and described another slab, the markings of which he regarded as made by an animal generically related to the former.

In 1875, Prof. Dana, in his Manual of Geology, page 123, says: "No remains of legs are found with any Trilobites."

In 1876, Dr. Nicholson, in his Manual of Zoology, page 219, says: "No traces of ambulatory or natatory limbs, of branchiæ or of antennæ, have ever been discovered. On the under surface of the body nothing has hitherto been discovered except the hypostoma or labrum. It has generally been supposed that the axial lobes protected a series of delicate respiratory feet; but this view is doubted by many authorities, and the question is one which we have at present no means of deciding."

In 1878, Prof. Huxley, in his Anatomy of Invertebrate Animals, page 220 (Am. Ed.), says: "Limbs or appendages capable of effecting locomotion are always attached either to the head or to the thorax—the extinct Trilobites possibly form an exception to this rule." Again, page 224: "Now, among the water-breathing Arthropoda no trace of limbs has yet been certainly discovered among the Trilobites."

In the Encyclopedia Britannica, ninth edition (*vide* Crustacea), Mr. Henry Woodward, F.R.S., says: "At present more evidence is needed as to the nature of the locomotory appendages of this extinct group—Trilobita."

In a letter from Mr. C. D. Walcott, dated June, 1883, he states that all his recent sections "simply corroborate the views given in his pamphlet of 1881."

These numerous references and quotations are given to show the distrust and uncertainty in the minds of prominent naturalists as to the limbs of the Trilobites.

In the autumn of 1882 the Trilobite, *Asaphus megistos* (Fig. 1), was sent me for examination. In the delay of correspondence with paleontologists, fortunately, no report was made, for in the spring of 1883, twelve months after finding the first specimen, the same party found the second, which proved to be the matrix of the ventral surface of the first specimen. It was found about one hundred meters from the point where the first was obtained.

About two thirds of the cephalic shield is broken off. That part of the head anterior to a line drawn obliquely through the left eye to the middle of the pleura of the second thoracic somite on the right is entirely wanting. With the head restored, the specimen would be about 18.5 centimeters ($7\frac{3}{8}$ inches) long; in width, 11.5 centimeters (about $4\frac{1}{2}$ inches). On the ventral surface (Fig. 1) a broad median *groove* extends along the concavity of the thorax and abdomen. It begins at a point beneath the articulation of the head with the thorax, or in the posterior part of the area between the lobes of the hypostoma. Its length is 10.5 centimeters ($4\frac{1}{8}$ inches)—6.5 centimeters being the length of the thoracic, and four centimeters that of the abdominal portion of the groove. This specimen clearly demonstrates the *concavity* of the three principal divisions of *Asaphus*, a fact which Mr. Billings pointed out in 1864. The vertical distance from the dorsal surface of the head to a line in the plane of the external margins of the pleuræ is 2.5 centimeters (about one inch).

Directly beneath the eight somites of the thorax, *ten* pairs of jointed limbs are distinctly seen; the two anterior pairs of appendages are situated directly under the first two thoracic segments; but from the character of these appendages, as well as the relation of parts, these, while having the general appearance of organs of locomotion, yet were, no doubt, maxillipedes with the basal joints articulated to the body of the animal, near the point where the oral aperture certainly existed, and presumably they were differentiated to perform the function of mouth organs, and consequently should be considered as belonging to the cephalic division. The remaining eight pairs of legs are then directly referable to the eight thoracic somites. The number of joints in a limb can not be definitely given from a study of these specimens; the basal joints are not preserved at the median groove.

Following the terminology of Milne-Edwards for the several parts of the limb of a crustacean, the prominently-marked portion of these ambulatory limbs is undoubtedly the meropodite, which was in some

cases two centimeters in length and quite large, with the mero-carpopodite articulation well pronounced, so as to leave a distinct, pit-like depression in the matrix. The several joints externally to that which is considered the meropodite can be distinguished by careful study of the several legs and the grooves and foveæ of the matrix. The carpopodite was about the length of the meropodite, but decidedly slender as compared with the latter. If there was any positive evidence to show that these were broad, lamellar appendages, adapted to swimming, then the slender joints external to the meropodite might be accounted for by supposing the edges were the portions visible. The propodite was about two thirds the length of the carpopodite, and also appears to have been slender and slightly curved backward; the dactylopodites are not well preserved, yet sufficiently so to permit the conclusion that they were not chelate. The posterior pair of these thoracic appendages is directly beneath the posterior somite of the thorax. The meropodites of the two anterior pairs of appendages, as shown in fig. 3, resemble the same joints in the thoracic limbs.

In examining the matrix, fig. 3, *d*, where the left limb of the anterior pair is well preserved, it is seen to curve around the outer margin of the left lobe of the hypostoma, and from the evidence which the surface presented when first examined, I am of the opinion that this limb was chelate. In removing the limestone so as to expose the left lobe of the hypostoma, and also establish the articulation of the claws, an accidental stroke destroyed the evidence of this direct connection, yet at the fracture the ends of two broken claws can yet be seen. At first I was disinclined to regard the distal extremity of this pair as chelate. Before attempting to remove the limestone, the surface clearly showed a conjunction of these parts. This condition could have been accounted for by supposing one limb to have been thrown over another. It was to clear up this point that the removal of the adhering material was made. If chelate, the claws were slender and of about equal size as in *Limulus*. As the hypostoma is frequently found in this limestone formation, it is to be hoped that these limbs will also be found, so as to definitely settle this point. On fitting the two specimens together, the ends of these supposed claws are seen at the fracture directly beneath the left eye. These specimens demonstrate that the thoracic appendages were well developed, walking legs extending nearly to the outer margins of the carapace. The exoskeleton of the limbs seems to have been somewhat different in character from the calcareous exoskeleton of the dorsal surface of the animal. At least, it was of such a character as not to preserve well the integrity of the parts in the process of fossilization. They could not have been soft and yielding, judg-

ing from the symmetry of the matrices of the Meropodites, as well as from the general cylindrical character of limbs themselves.

On the ventral surface of the pygidium there are at least twelve (pairs of) appendages; posteriorly, an exact enumeration is impossible. The term *pairs* is used on account of the median groove, showing in the structures a bilobed character. This groove is continuous with the thoracic groove, and is somewhat narrower and more shallow than the latter. From an examination of the two specimens, these twelve or more appendages appear to be leaf-like, or foliaceous, and on each side of the median groove the direction was outward and somewhat forward. No doubt these appendages were branchial in function, and also adapted to swimming.

These specimens will prove of interest to zoologists, especially from a taxonomic point of view. Spence Bate and Henry Woodward, of England, and Prof. Dana, of this country, regard the Trilobites as closely related to Isopoda. Woodward homologizes thus:

TRILOBITA (fossil or extinct).

1. Eyes sessile, compound.
2. No ocelli visible.
3. Appendages partly oral, partly ambulatory, arranged in pairs.
4. Thoracic segments variable in number, from six to twenty-four, free, movable; animal sometimes rolling in a ball.
5. Abdominal somites coalesced, forming a broad caudal shield, bearing the branchiæ beneath?
6. Lip-plate well developed.

ISOPODA (fossil and living).

1. Eyes sessile, compound.
2. No ocelli visible.
3. Appendages partly oral, partly ambulatory, arranged in pairs.
4. Thoracic segments variable in number, from six to twenty-four, free, movable; animal sometimes rolling in a ball.
5. Abdominal somites coalesced, forming a broad caudal shield, bearing the branchiæ beneath.
6. Lip-plate small.

If the conclusions herein expressed in the interpretation of the abdominal appendages of *Asaphus megistos* are correct, then the mark of doubt in No. 5 of Woodward's homological table may be removed.

Prof. E. Van Beneden, of Belgium, believes the Limuli are not crustaceans, and, from a study of their embryology, concludes that they can not be separated from scorpions and other arachnida. This view, in which he is not alone, if correct, would carry the Trilobites out of the class crustacea.

Dr. Packard, in his excellent work on the "Development of *Limulus polyphemus*," places the Xiphosura and Eurypterida as suborders under the order Merostromata, which is followed by Trilobita as a separate order. This view is accepted by Dr. Lockwood and Mr. C. D. Walcott. It remains for zoologists to place whatever value may attach to the fact of the appendages of Trilobites subserving the purposes of *branchial* organ, of *manducation*, and of *locomotion*, either ambulatory or natatory.

IN MEMORIAM.

CHARLES B. DYER.

The undersigned committee, appointed to prepare a memorial on Mr. Charles B. Dyer, beg leave to report the following—

Mr. Charles B. Dyer was born near Dudley Castle, in Worcestershire, England, April 1, 1806, and died, at his suburban home, on Mt. Harrison, in this city, on the 11th day of July, 1883.

In early years he was compelled to labor for himself, and the support of his mother, and, consequently, his education was neglected. In 1828 he came to this city, and soon thereafter located on Columbia street, and engaged in business as a soap and candle manufacturer. In 1832 he married Miss Elizabeth Langtry, who survives. They had nine children, seven of whom are living, and most highly respected. He commenced business on Columbia street, without money, and on a small scale, but, by constant labor, night and day, extended his trade, and accumulated a competency. As soon as he felt himself secure in monetary affairs, he retired from business. This was about thirty years ago. He was active and industrious, and method characterized every thing he did.

In his younger years he was fond of hunting, and, when his interest first began to attach to fossils, he would start his hunt for game with a gun, and return with a pocket full of fossils. Soon after he retired from business, the gun was laid aside for the hammer, and, from that time until his death, he was an ardent, energetic, palæontological collector.

He acquired some knowledge of nearly all branches of Natural History, and became quite conversant with local botany. He beautified his home in the selection of trees, and made it most lovely with plants and the fragrance of flowers.

His collection grew so rapidly, that, in the course of ten or fifteen years, it became somewhat noted, and, in 1866, eight new species were described from it; these were followed by as many more, in 1871, which appeared in the Twenty-fourth Report of the New York State Museum of Natural History. The collection was thrown open to Prof. Meek, and, in 1873, many fossils from it were illustrated in the first volume of the Ohio Palæontology. Since that time numerous species have been defined in the publications of this Society, and in the Cincinnati Quarterly Journal of Science, beside seventeen species, which appeared in a paper entitled, "Contributions to Palæontology, No. 2, by S. A

Miller and C. B. Dyer." In 1880, the collection of fossils, weighing more than seventeen thousand pounds, was sold to Prof. Agassiz, and removed to the Cambridge Museum.

Mr. Dyer was a benefactor of science, and, as an evidence of the esteem in which he was held by his contemporaries, nine fossil species are made to commemorate his name.

He was a self-made man, in all respects, and possessed much more than ordinary intellectual firmness. Without the advantages of an education, or means with which to make a start in life, by the severest toil he accumulated a respectable fortune, at the expense somewhat of his physical vitality, and retired from business before he arrived at the age of fifty. He then devoted himself to the study of nature and the accumulation of a library, and died a well-informed man, of whom it may well be said, the world is better off for his having lived.

He was respected and admired by all for his unfaltering truthfulness and honesty in all the relations of life. He died, after a severe illness of three months, surrounded by an affectionate and loving family. As he was not a member of any church, the funeral services were held in the parlor of his residence, without the assistance of a minister. They were very plain, and consisted alone of music upon the parlor organ, and a few remarks from his friend, S. A. Miller. The pall-bearers were U. P. James, E. M. Smith, Alonzo Anderson, William H. Lowry, S. A. Miller and Dr. O. D. Norton. He was interred in Spring Grove Cemetery.

The address of Mr. S. A. Miller was an appropriate and fitting tribute to his memory, and we are glad to be able to present it as part of this report. He said:

Relatives and Friends of the Deceased :

The trees are loaded with foliage, the wild flowers are in bloom, nature is active in developing tissues and speeding the growth of organisms—it is midsummer, and we have assembled around a casket containing a friend whose life is now no more, not to pay the last, nor a parting tribute to his memory, but as a manifestation of our regard for him, and the noble qualities of manhood which he possessed. The latter survive, and will live with us when the trees have lost their luxuriance, when the heat of the sun has ceased to fructify, and all without betokens the coming of winter. They will live with us in winter and summer, with each returning day and season, so long as we shall be able to appreciate integrity, honesty, devotion to science, and the higher cultivation of the mind.

In every country homage is paid to the illustrious dead. The

features of the statesman and the warrior are preserved in bronze and marble. Why should we not cherish the name of Charles B. Dyer, who, through many long years of labor and research, in the exposures of the rocks of our own city and country, made known to science, through the images preserved in stone, the hidden secrets of ancient and extinct life? He expanded the boundaries of knowledge, and discovered many of the characters by which we are enabled to read the structure of the earth, and to form an opinion of its immense duration, and the millions of ages which have transpired and been consumed in the annihilation, as well as in the development, of vegetable and animal organisms. We read of the growth of ages in the characters of the fossil shells, among which Mr. Dyer was the first to bring to light nearly a hundred distinct species.

We learn to distinguish between the ages by the forms of the stony shells, and to pass back, in time, from one age to another, until the strongest mathematical mind is unable to comprehend the figures which express the years that must have rolled around, and yet we have not reached a beginning. The world was then as large as it is to-day, and possessed of all the elements of which it is now composed, so far as one can judge by any fact or reason yet presented or suggested to the mind of man. Science does not teach us of a beginning. It deals in *finite* things, and instructs alone in matters within the comprehension of *finite* minds. Resting, therefore, upon all that science had discovered of the past, with a full realization of all the proofs of high antiquity, Mr. Dyer was unable to comprehend the beginning of the world, and, being honest to himself and others, never pretended to understand the subject, or affected to believe any of the prevailing traditions about it. He could not penetrate the future by his vision, nor by any other faculty of body or mind; but, judging of the future by the past, he concluded the world will continue in its course for ages, and then there will be as little reason for looking forward to its ending as there is now. The past was to him as incomprehensible as eternity, and the future involved in the same endless obscurity; but his heart was always ready to leap with joy at the wonderful mutability and bloom of the world.

He sat at the feet of nature, unpretending, and full of candor. The work of collecting and determining the characters of organic forms was with him a labor of love, not because he expected to profit by it so much himself as he hoped to advance and disseminate knowledge and truth, and promote the welfare of his fellow-man. This he did, in a marked degree, for many years, not that he published the results of

his toil, and distributed them far and wide, but he furnished his work to others for publication, and we find it in the reports of the New York State Museum of Natural History, in the Geological Survey of Ohio, in the Cincinnati Quarterly Journal of Science, in the Journal of the Cincinnati Society of Natural History, and elsewhere. It added to the fame of the much-lamented Meek, and the equally distinguished Hall; others have sipped from the same fountain, and I have been a frequent visitor at its overflowing border.

He was possessed of broad humanity, and unerring sense of justice and right, with invincible courage in the maintenance of his convictions. In the pursuit of truth he trained his mind to right thinking, until rectitude was as much a part of his moral nature as of the intellectual, and, consequently, his views upon politics, religion, and other topics, were honestly and fearlessly advanced, whenever the occasion seemed to demand their utterance, though there was nothing controversial in his character, and he was never a disputant.

In his death we have lost a friend, science a devotee, and all humanity a benefactor, and there is left only the satisfaction that the world has been benefitted by his existence.

In conclusion, I will quote from one of his favorite poets what seems appropriate and applicable to him:

"The virtuous man,
Who, great in his humility, as kings
Are little in their grandeur; he who leads
Invincibly a life of resolute good,
And stands amid the silent dung on depths
More free and fearless than the trembling judge,
Who, clothed in venal power, vainly strove
To bind the impassive spirit. When he falls,
His mild eye beams benevolence no more:
Withered, the hand outstretched but to relieve,
Sunk, reason's simple eloquence, that rolled
But to appal the guilty. Yes! the grave
Hath quenched that eye, and death's relentless frost
Withered that arm: but the unfading fame
Which virtue hangs upon its votary's tomb;
The deathless memory of that man, whom kings
Call to their mind and tremble; the remembrance
With which the happy spirit contemplates
Its well-spent pilgrimage on earth
Shall never pass away."

R. M. BYRNES,	}	<i>Committee.</i>
L. S. COTTON,		
F. W. LANGDON,		

Fig. 1.

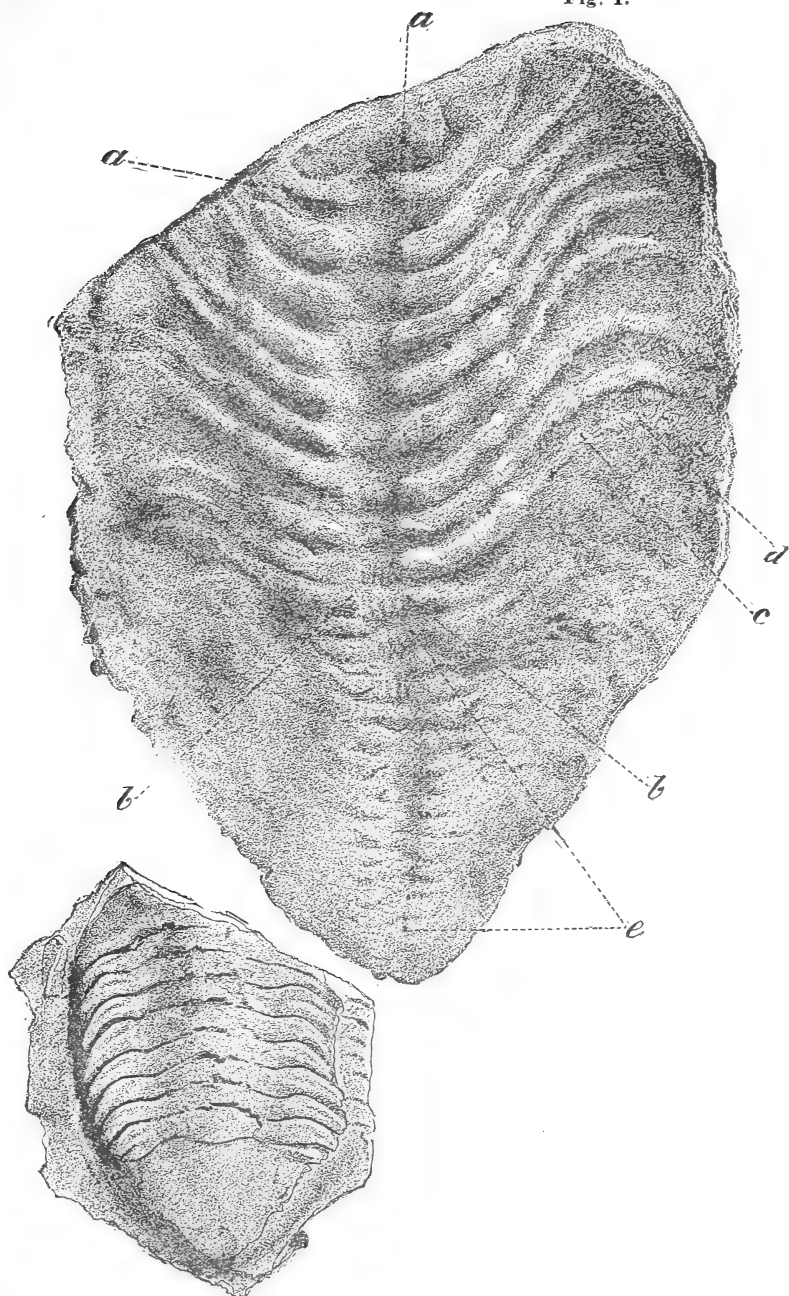


Fig. 2.

FIG. 1.—Natural size. *aa*, meropodites of anterior pair of appendages,—maxillipedes; *bb*, eighth pair of (thoracic) legs; *c*, articulation between carpopodite and propodite; *d*, articulation between propodite and dactylopygidium; *e*, branchigerous organs beneath pygidium.

Fig. 2.—The specimens 1 and 3 fitted together, and reduced to nearly one third nat. size.

Fig. 3.

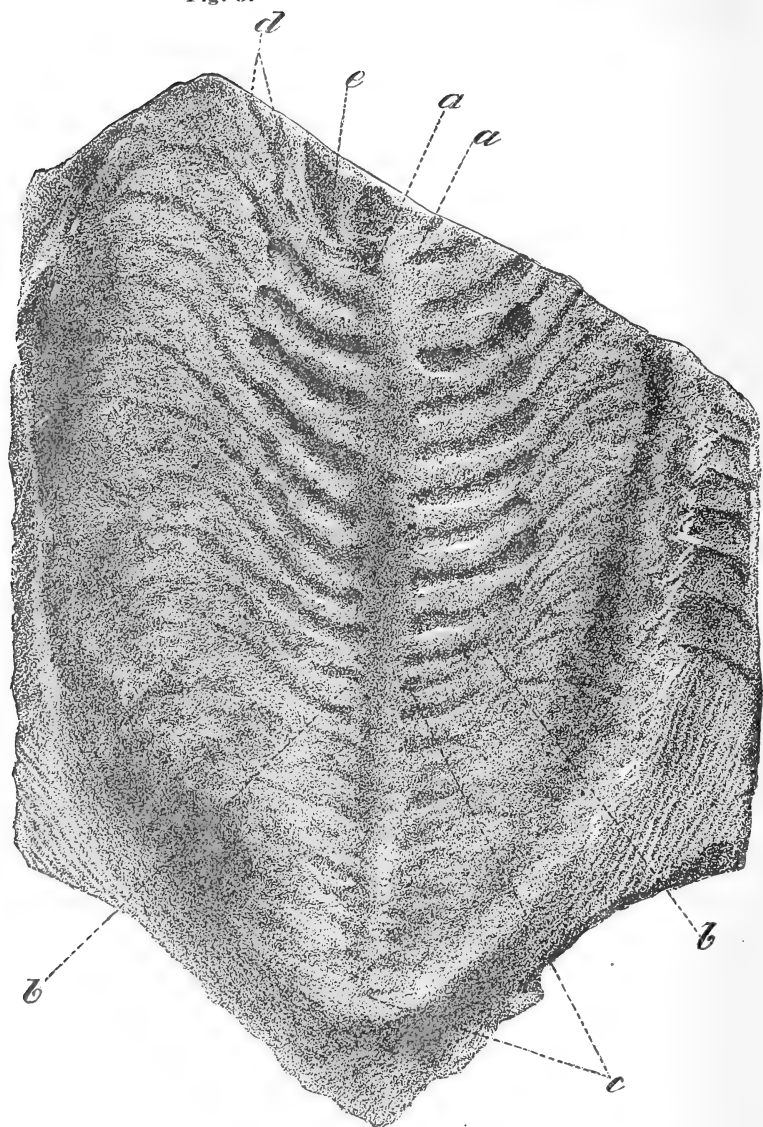


FIG. 3.—*a a*, matrices of meropodites of anterior pair of appendages; *b b*, matrices of eighth pair of legs; *c*, branchigerous appendages; *d*, left maxillipede, probably chelate; *e*, left lobe of hypostoma.

JOHN A. WARDER.*

The subject of this brief memorial notice, John A. Warder, was born near the city of Philadelphia, January 19, 1812, and he died July 14, 1883, at his residence near North Bend, Ohio. He was the eldest son of Jeremiah and Ann A. Warder, who belonged to the Society of Friends. The family moved westward, and settled near Springfield in 1830. There the son took an interest in the science of medicine, and received instruction in the profession of his choice at Jefferson Medical College, in Philadelphia, where, after a successful career as student, he obtained the degree of "Doctor of Medicine." As soon as qualified to practice his profession, he entered upon its arduous duties, and became a capable and reputable practitioner. In 1837 he married Miss Elizabeth E. Haines, and changed his field of labor to Cincinnati. Here he found a number of enthusiastic students in the various branches of Natural Science, and became a congenial spirit among them. He was an active member of *The Western Academy of Sciences*, and labored for the interests of the Society with a zeal that is rarely manifested. He imparted to the Association an impetus that was appreciated and acknowledged by enthusiastic fellow-workers.

Dr. J. A. Warder was a public-spirited man, and looked beyond present and immediate surroundings. He was endowed with a disposition to rest unsatisfied with bare utilitarianism—he must ornament, beautify, and improve. He possessed energy enough to be progressive, hence he became a leader in enterprises which charmed him most. His fellowship was always with the good; and deserving objects met encouragement at his hands. His tastes were æsthetic, and his talents led him into scientific and philanthropic pursuits. Any scheme which had in view an apparent betterment of the human family was sure to find in him an ardent supporter.

In later life Dr. Warder attained a foremost position among florists, horticulturists, and the advocates of forestry, or systematic tree-planting. In the latter industry he had secured a national reputation, and long will be known by faithful labors executed for the happiness of the race. Nothing in the universe escaped his inquiring mind; his studies were varied, and sometimes profound, and he enjoyed opportunities for observation, comparison, and reflection in foreign countries.

Dr. Warder was a believer in revelation, and could see in Nature the evidence of Divine management. During a somewhat prolonged career,

*President of the Cincinnati Society of Natural History from its organization in 1870, to April, 1875.


he made no enemies, yet many friends, and those who knew him best unanimously declare that his daily life was that of an upright man.

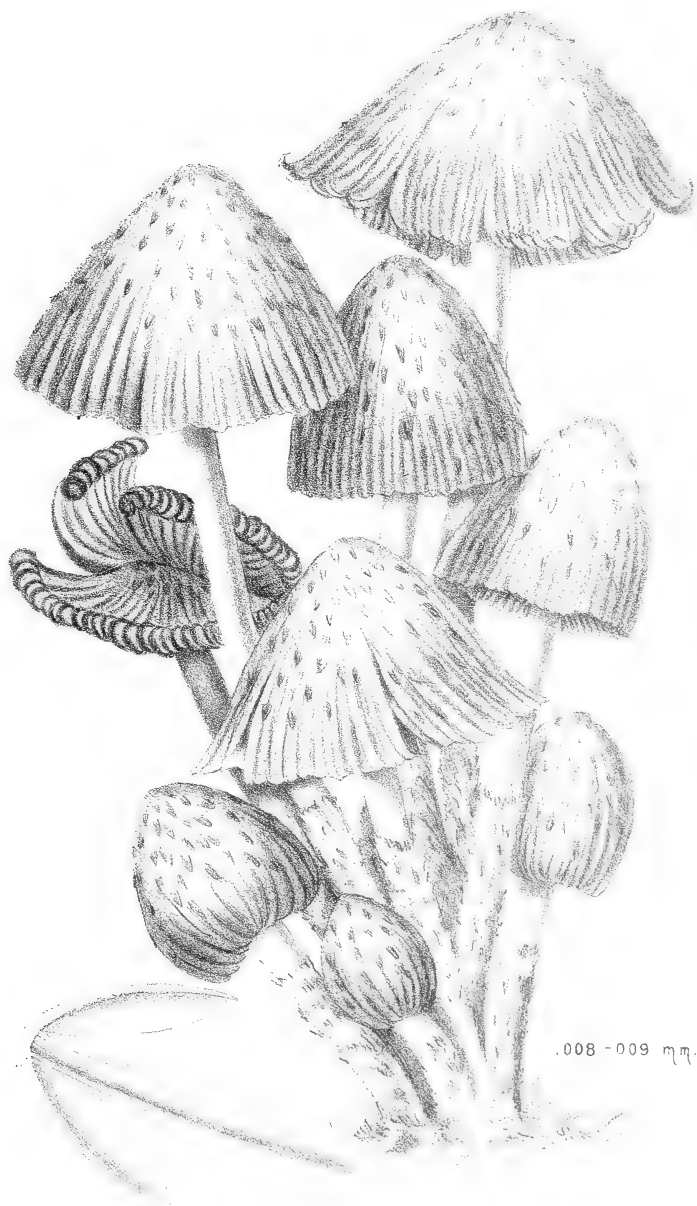
R. B. MOORE,
A. E. HEIGHWAY, Sr., } *Committee.*
A. J. HOWE,

A PHOSPHORESCENT FUNGUS.—There are a number of species of Fungi which emit light when in the dark, and among them are at least two common forms belonging to our flora, viz: Polyporus sulfureus, Fr., and Panus stypticus, Fr. The former has long been known as a phosphorescent species, but it is believed that the phenomenon has not been before noted in the latter. While putting away some collections last autumn, I noticed that the specimens in one corner of the box emitted a faint bluish light, which was found, upon examination, to come from the hymenial surface of Panus stypticus. The specimens were still moist, and continued to emit light, till quite dry.

DAVIS L. JAMES.

LECTURES.—The course of ten lectures on Botany, by Prof. Joseph F. James, the custodian of the Society, which concluded on August 11, 1883, was more successful than the Executive Board had reason to expect. The late date at which the lectures began made the attendance smaller than it would have been had they commenced earlier. Encouraged by the favorable reception of these lectures, and believing that the society may do useful work in this direction, it is the intention to give a course of free lectures during the winter, upon General Zoology. A number have already been arranged for, and the programme will be shortly announced. It is the desire of the committee having the matter in charge that all members shall use their influence in securing a large attendance, for it is believed that by making the lectures popular, and by giving them as far as possible a local character, an increased interest in natural science will be fostered in the community. It is hoped that the committee will begin the lectures during the present month (October), and if the interest justifies it, another course on Geology, Mineralogy and Botany in January.

 The following numbers of the JOURNAL OF THE CINCINNATI SOCIETY OF NATURAL HISTORY are desired by the Society: Vol. I., No. 3; Vol. II., No. 3; and Vol. III., No. 2. Any one having extra copies of the same for exchange will oblige by conferring with the Custodian or Librarian.



COPRINUS SQUAMOSUS, MORG.



.0083 X .0056 m.

HYGROPHORUS LAURÆ, MORG.



V. J. Chauncey

THE JOURNAL
OF THE
CINCINNATI SOCIETY OF NATURAL HISTORY.

VOL. VI. CINCINNATI, DECEMBER, 1883. No. 4.

PROCEEDINGS OF THE SOCIETY.

TUESDAY EVENING, *October 2*, 1883.

Business meeting.

President Hunt in the chair, sixteen members present.

The minutes of the preceding regular business meeting, for April (the July meeting being passed for want of a quorum) were read and approved.

The minutes of the executive board for July, August and September were read.

Mr. Chas. Dury read a paper on the "New Museum Pest" (*Tyroglyphus entomophagus*), which had of late been destroying his collections of insects. The only substance which seems to affect the mite is naphthaline. This destroys it. The paper was referred for publication.

Mr. Dury exhibited quills of the Porcupine, showing their various forms.

Dr. A. E. Heighway exhibited a fine collection of minerals and geyser deposits from the Yellow Stone Park, and gave an account of a visit he had lately paid to that region.

Dr. F. W. Langdon showed a specimen of the incisor tooth of the extinct beaver, *Castoroides ohioensis* (a note respecting it will be found in another page of the Journal).

Prof. J. Mickleborough showed a specimen of a fossil belonging to the Chemung group, *Leiorhynchus kelloggi*, from the drift near Hamilton, Ohio.

Mr. T. H. Aldrich presented the society with a specimen of the rare shell, *Voluta junonia*, L., from Tampa Bay, Fla.

Prof. A. P. Morgan exhibited a drawing of a gall, upon an oak leaf, which was described by Schweinitz as a fungus under the name of *Volutella quercina*.

Mr. J. F. James called the attention of the audience to a skull said to have been taken from a mound near Memphis, Tenn. The skull showed a remarkable flattening at the back. In the collection of pottery accompanying the skull was some pottery bearing the date of 1708 and 1654.

Donations were received as follows: From publishers Am. Jour. of Science, 2 numbers of Journal, July, 1876, November, 1877; from Wm. R. Lazenby, Columbus, one pamphlet, Bulletin No. 1, Ohio Experimental Station; from U. P. James, 7 numbers Paleontologist complete, one Catalogue Lower Silurian Fossils; from U. S. Fish Commissioner, 17 signatures Bulletin U. S. Fish Commission; from R. W. Shufeldt, M.D., Pamphlet on Habits of Chameleon; from Smithsonian Institution, Proceedings U. S. Nat. Museum, Nos. 6, 7, 8; from Col. Chas. Whittlesey, Cleveland, Ohio, pamphlet, Metrical Standard of the Mound Builders; from Isaac Smucker, Newark, Ohio, pamphlet, Mound Builders' Works, near Newark, Ohio; from Dr. G. M. Levette, 2d Annual Report Indiana Geological Survey; from Signal Service Bureau, Weather Review, July, 1883; from James R. Challen, Lot of Minerals, including gold, silver and copper ores; from D. A. McCord, Oxford, Ohio, stump of tree found in Glacial drift, near Oxford, Ohio; from T. H. Aldrich, specimen *Voluta junonia*, L.

Adjourned.

TUESDAY EVENING, November 6, 1883.

Scientific meeting.

Eight members present, not a quorum.

Donations were received during the month as follows: From the Smithsonian Institution, signatures 9 to 14, Proceedings U.S. National Museum; from Secretary of State of Illinois, Vol. VII. Illinois Geological Survey; from Chas. Dury, Snake from France, sp.?; from Mrs. Stanley, Linwood, O., Wasp's Nest; from W. D. Hixon, Maysville, Ky., Slab of Fossils; from J. F. James, Seeds of *Seymeria macrophylla*; from A. P. Morgan, Tenney's Manual of Zoology; from Davis L. James, Packard's Guide to the Study of Insects, Am. Antiquarian, Vol. I., No. 1; from Dr. Chas. Hentz, Indian River, Florida, specimen Moon Fish; from Dr. Richard Potter, Lake Worth, Florida, 2 specimens Sponges; from Thos. J. Duncan, 1 Spider; from Miss Ellison,

one Turtle's Egg, Florida, four Sea Beans, two specimens Vegetable Ivory; from Chas. F. Low, specimens of burnt clay, from mound near Newtown, Ohio; from W. W. Thompson, Proceedings Am. Association for the Adv. of Science, Montreal meeting; from Department of Agriculture, Report for 1881-2; from Miss B. Hollingshead, one Squid, *Loligo punctata*, from Mass.; from Boston Zoological Society, Quarterly Journal, Vol. 2, No. 4; from U. S. Naval Observatory, Washington, Astronomical and Meteorological observations during 1879; from Geological Survey of U. S., Williams' Report on Mineral Resources of the U. S.; from O. T. Mason, Washington, four pamphlets on Anthropology; from Chas. B. Going, 1 specimen *Jacquemontia tannifolia*.

TUESDAY EVENING, December 4, 1883.

Scientific meeting.

President Hunt in the chair, thirteen members present; and a number of guests.

Minutes of preceding scientific meeting for September were read and approved.

Prof. A. P. Morgan read a paper illustrated by drawings on "The Alternation of Generations in Mosses." The professor gave the latest views respecting the subject of alternation of generations and fertilization in cryptogams.

Mr. Chas. Dury read a paper on "The Occurrence of the Barn Owl, *Strix flammea*," which was referred to the committee on publication.

Mr. Dury also read a letter from Prof. G. Brown Goode, respecting the premiums awarded the United States at the International fisheries exhibition in London. 155 prizes were given to American exhibitors, including 48 gold and 47 silver medals.

Mr. W. H. Fisher presented and read a series of Ornithological Field Notes, which were referred to the committee on publication. He also read extracts from a letter of Mr. E. R. Quick, respecting two owls of materially different size, which were found in one nest.

Prof. A. G. Wetherby described the deposits of coal in the Sequatchie Valley of Tennessee, and noted the discovery of some new crinoid beds in that region.

Dr. W. A. Dun read a paper on the discovery of some old drawings of the ancient earthworks of the Miami Valley, which was referred to the publishing committee.

Prof. R. N. Roark, of Lebanon, O., and Mr. Chas. N. Woodward, of Morrow, Ohio, were elected to regular membership.

On motion, the society resolved to hold its next meeting on Tuesday, January 8th, as the first Tuesday of the month will be New Year's day.

Donations were announced as follows :

From Dr. Robt. Fletcher, 1 pamphlet, *Tattooing among Civilized People*; from U. S. Fish Commission, *Bulletin*, Sigs. 18 to 25; from Signal Service Bureau, *Weather Review* for September, 1883; from Smithsonian Institution, *Proceedings U. S. National Museum*, No. 15; from Geo. F. Kunz, one pamphlet, *American Gems and Precious Stones*; from Davis L. James, *Tenney's Elements of Zoology*; from Commissioner of Education, Washington, *Report for 1881*; from Library Company, *Bulletin* for July, 1883; Vassar Bros. Institute, Poughkeepsie, N. Y., *Transactions*, Vol. I., 1881-1883, *Science Record Company*, *Science Record*, Vol. II., No. 1; from U. S. Geological Survey, *Annual report for 1880-81*, *Bulletin* No. 1, on *Hypersthene Andesite*, etc.; from A. J. Cook, *Petrified Tree*.

Adjourned.

LECTURES.

As announced in the October number of the *JOURNAL*, the committee on lectures arranged for a course on General Zoology. They began on October 19th, and continued each Friday evening, to December 7th. The attendance, averaging over one hundred, was quite as large in numbers as could be comfortably seated in the auditing room; and at several of the lectures it was found impossible to give seats to all who came, and many stood during the entire lecture.

The lecturers were uniformly well received, and listened to with marked interest throughout. The following is the programme :

October 19th.—Introduction—'The Study of Zoology.—Prof. J. Mickleborough.

October 26th.—The Human Skeleton, as compared with that of other animals.—Prof. J. Mickleborough.

November 2d.—The Trochilidæ, or Humming Birds.—Chas. Dury.

November 9th.—Fishes.—Dr. D. S. Young.

November 16th.—Comparative Anatomy of the Mollusca.—Prof. A. G. Wetherby.

November 23d.—The Mollusca, from an Evolutionary Stand-point.—Prof. A. G. Wetherby.

November 30th.—Some Curious Insects.—Chas. Dury.

December 7th.—Practical Manipulation of the Microscope.—Dr. J. H. Hunt.

The committee hope soon to announce a second course, to be given during January and February.

J. F. JAMES,	} <i>Committee on Lectures.</i>
JOHN MICKLEBOROUGH,	
A. P. MORGAN,	

GLYPTOCRINUS REDEFINED AND RESTRICTED,
GAUROCRINUS, PYCNOCRINUS AND COMPSOCRINUS
ESTABLISHED, AND TWO NEW SPECIES DE-
SCRIBED.

By S. A. MILLER.

The species that have been referred to the genus *Glyptocrinus* include a great diversity of forms possessing essential differences in construction, if we place reliance upon the order of arrangement of the plates, in either the columns, calices or arms. The grouping is such that no single generic character can, with certainty, be ascribed to all the species. Of course, sooner or later, they will be arranged in different genera; to do this, however, successfully, at this time, is not an easy task.

A partial subdivision may be accomplished, and to this end the present article is devoted. Those from the Upper Silurian will not be discussed, because we are not sure that any of them belong to *Glyptocrinus*, and because we have not at hand suitable specimens for examination and description. The remarks will be confined, therefore, alone to those occurring in the Lower Silurian rocks of this country.

Messrs. Wachsmuth and Springer have made *G. lacunosus* the type of the genus *Archæocrinus*, and included in it, *G. marginatus*. This genus is distinguished from *Glyptocrinus* by its subglobular form, large basals, and wide interrarial areas. The arms become free at the second or third secondary radials, are short, widely separated, and bifurcate soon after becoming free. The column is composed of very thick projecting plates, separated by very thin ones in the upper part, but lower down becomes smooth. The vault is unknown, but it is doubtless different from that in *Glyptocrinus*. The genus may be readily recognized, and was properly made.

G. quinquepartitus was founded upon a subpentagonal, quinquepartite column, composed of alternately thicker and thinner plates, and as nothing more is known of it, it will not be further considered.

G. dyeri var. *sublævis* is distinguished from *G. dyeri* only by the absence of the sculpturing on the plates of the calyx, and as this may not have existed during life, or may have resulted from age, accident, injury, or later chemical or mechanical action, it may not be of even varietal signification, hence it will not require further notice.

The species described by Prof. Wetherby, under the name of *Reteo-*

crinus gracilis, is a synonym for the species which I had described under the name of *Glyptocrinus angularis*.

There remain for disposition, without including the new ones herein described, twenty-two species, as follows: *G. angularis*, *G. argutus*, *G. baeri*, *G. cognatus*, *G. decadactylus*, *G. dyeri*, *G. fimbriatus*, *G. fornshelli*, *G. harrisi*, *G. miamiensis*, *G. nealli*, *G. ornatus*, *G. parvus*, *G. pattersoni*, *G. priscus*, *G. ramulosus*, *G. richardsoni*, *G. sculptus*, *G. shafferi*, *G. shafferi* var. *germanus*, *G. subglobosus*, and *G. sub-nodosus*.

None of these are known to have attached to other objects, by a flattened base or by roots, while some had columns that tapered to a point, and are not unfrequently found coiled around other columns, but they are considered, nevertheless, free crinoids. The columns have a pentagonal central canal, the arms bear pinnules, and there is some general resemblance in other parts, but no agreement which will permit them to be referred to the same genus.

The question that now arises is, what characters shall be regarded as of generic importance? In determining this, reliance will be placed upon this assemblage of crinoids, without undertaking to lay down rules of universal application.

The presence or absence of subradial* plates is regarded of special generic importance, because no two species differing in this respect are very nearly allied in others, and because, in each species, whether the specimens are large or small, this part of the calyx is stable, excepting, alone, the regular enlargement by growth.

The presence or absence of secondary radials seems, too, to be of generic importance, because their presence doubles the number of ambulacral furrows that penetrate the body, and materially heightens and changes the vault.

* Some genera of crinoids have a single ring of plates between the column and the first radials, others have two rings. Most American authors, and I might say all, until quite recently, have called the plates, in the first ring above the column, the basals, and when the second exists they have called them subradials. Certainly no names can be easier or more expressive. I have, usually, followed this nomenclature, and shall do so in this article.

The plates of the second ring have been called "parabasals" by some European authors. More recently some have called the plates of the second ring the basals, and those of the first ring the under basals. In other words, if only one ring exists the plates are called basals, but if two rings exist the plates of the first ring are called under basals, and those of the second, basals. This has given rise to the expression in describing species, "under basals, obsolete," which every one must concede is ridiculous. The policy of changing the nomenclature may well be doubted, and ought not to be entered upon without the clearest conviction, that, by so doing, error of some kind is being eradicated. The claim is made, that the change will bring the nomenclature used in defining recent crinoids in uniformity with that used in describing fossils, but as long as this is doubted, it is better to adhere to the established or prevailing methods of description.

The structure and form of the column is frequently of controlling generic value, but, in the present classification, there are exceptions which subordinate this, possibly, to specific importance only.

The presence or absence of a proboscis on the vault, or other marked difference in its construction, is of generic importance, but, unfortunately, the vaults of only a few of these species are known.

In the light of these preliminary rules, it is proposed that the genus *Glyptocrinus* shall be confined to those species possessing the following three characters, to-wit: basals, five; primary radials, three by five; and secondary radials, one or more by ten. All of the species that have been referred to this genus possessing the above three characters have round columns, composed of thinner and thicker plates, except *G. fornshelli*, and it may be doubtful whether it should be retained in the genus, for reasons which will be given in the discussion of its specific characters.

Under the generic name of *Gaurocrinus*, will be included all the species possessing the four following characters, to-wit: Basals, five; subradials, five; primary radials, three by five; and secondary radials, one or more by ten. These species have both round and pentagonal columns, but the latter prevail. This genus is primarily distinguished from *Glyptocrinus* by possessing five subradials. *G. nealli* will be the type.

Under the generic name of *Pycnocrinus*, will be included those species possessing the following characters, to-wit: Basals, five; primary radials, three by five, and which do not possess any secondary radials. These are primarily distinguished from *Glyptocrinus* by having no secondary radials. The columns are round, the calices small, and the vault is supposed to be quite distinct from that of *Glyptocrinus*, though it is too little understood to permit a comparison. *G. shafferi* will be the type.

Under the generic name of *Compsocrinus*, will be included those possessing the following characters, to-wit: Basals, four; primary radials, three by five; secondary radials, two or more by ten; tertiary radials, more or less numerous; arms, twenty or more. These are primarily distinguished from *Glyptocrinus* by having only four basals. The type is *G. harrisi*.

Having in my collection specimens belonging to nearly all the species, and being in possession of many of the types, I propose to examine somewhat at length the characters of each species, beginning with those which I now refer to *Glyptocrinus*, and first with the type of the genus.

GLYPTOCRINUS DECADACTYLUS (Hall.)

(Plate XI., fig. 1. Vault of *G. decadactylus*, magnified three diameters. The arms have been broken downward and outward, so as to show the vault in its extension over the ambulacral furrows. and the first joint of the pinnules on each side of the furrows. The opening on the vault is within the wrinkle. and can not be seen on this specimen. Fig. 1a, fragment of the lower part of an arm, showing the integument covering the ambulacral furrow, and the first joint of the pinnules on each side, magnified six diameters. Fig. 1b, Transverse section of an arm magnified six diameters. It was not made from a prepared microscopic section, and may not therefore be strictly accurate. Fig. 1c, fragment of a vault showing the supposed excurrent opening, magnified six diameters)

Definition.—The column is round, composed of alternately thicker and thinner plates, the former projecting, and perforated with a pentagonal canal. Calyx obconoidal, interradial and intersecondary radial areas flattened in the lower half and more depressed above, with intertertiary areas deeply sunken, and strong radial ridges. There are five thick, sculptured, pentagonal, basal plates, about as wide as high, and about one fourth as large as the first primary radials. The lower part of the plates have a flange, which united forms a ring a little larger than the top of the column.

The primary radials are 3 by 5, the first heptagonal, second hexagonal, and third heptagonal. The secondary radials are 2 by 10. The tertiary radials are 5 to 8 by 20, above which the arms are free. The regular interradial areas have one plate resting upon the primary radials, two in the second range, three in the third, two or three in the fourth, and above these fifteen or twenty small plates in each depressed intertertiary area. Intersecondary radial areas have one rather large plate in each axil, and a dozen or more smaller ones filling the depression between the tertiaries. Intertertiary areas have in like manner one plate in each axil, and several smaller ones above. Azygous area has one plate resting upon the primary radials, three in the second range, three in the third, three or four in the fourth, four in the fifth, and above these thirty or forty small plates filling the depression between the tertiaries. A very strong ridge arises at the center of the first azygous plate, and extends straight up the center of the azygous area to the fourth range of plates, and continuing, gradually diminishing in size, seems to disappear at about the eighth plate, or between the second or third tertiaries. Arms twenty, long, rounded on the outer side and furrowed on the inner, and composed of cuneiform plates, each of which supports at its larger end a pinnule composed of joints three or four times as long as wide. The pinnules begin on the fourth or fifth tertiary, so that three or four occur on each side below the top of the vault. They are directed upward on each side of the extension of the vault, over the ambulacral furrow.

The vault has never been hitherto clearly defined, and some authors have entertained very erroneous opinions respecting it. I am glad, therefore, to be able, through the assistance of specimens from the magnificent collection of Dr. R. M. Byrnes, to more particularly and more fully describe it.

It is somewhat convex in the central part, and undulates toward each intertertiary area. It is composed of numerous polygonal plates. Those in the central part are the larger ones, and each of these bears a central tubercle, which is sometimes prolonged so as to be designated a spine. Toward the margin, or rather following the undulations toward the intertertiary areas, the plates are smaller and possessed of slight convexity. They unite in the depressions in the intertertiary areas with the plates of the calyx, or rather the interprimary radials graduate through the intersecondaries and intertertiaries to the plates of the vault without any line of separation. The plates become smaller as they approach the inner face of the arms, over the swelling undulations of the vault, and continuing to decrease in size, form a somewhat granular, continuous integument, that covers the ambulacral furrows. This continuation of the vault up the inner side of the arms has been observed for the distance of an inch above the vault, and no doubt extended as far as the arm furrow itself. The pinnules do not cover the ambulacral grooves. *Notwithstanding the magnificent pinnules upon the sides of the arms, in this genus, the ambulacral furrows are covered with small plates between the rows of pinnules, and the pinnules have nothing to do with covering the furrows.*

• The reason emphasis is placed upon the fact is, Wachsmuth and Springer have doubted and even denied it. They say in their "Revision of the Palæocrinoidea," p. 25 :

"It is important to note, that in those genera in which the ambulacral groove is thus covered, no regular pinnules have ever been observed, and, moreover, the construction is such that no additional pinnulæ could have existed ; while on the other hand no covering has ever been discovered in forms with true pinnulæ."

And, finally, they come to the conclusion that the plates covering the ambulacral groove were homologous with the pinnulæ, or, as they say, "in fact rudimentary pinnulæ."

It is not easy to understand how pinnules should, in any case, act as a covering to an ambulacral groove, and as I have never seen a specimen which was calculated to make any such impression on my mind, I am unable to realize how those authors arrived at such a con

clusion. To correct such erroneous views, and to settle the question, at least with regard to this genus, I beg leave to call the attention of the reader to the illustrations of this species on Plate XI., as well as to what is here said.

The excurrent opening is situated subcentrally upon the upper face of the vault. It appears as a subcircular, depressed conical elevation, composed of plates, imbricating toward the center, while a few of the surrounding plates have rather long spines, inclined toward the central part of the orifice. One specimen showing the lower side of the vault, indicates the extension of a sack like form into the cavity below this excurrent opening, and it may be, that there was such connection with the ambulacral furrows, that this opening needed such support, but as I am unable to distinguish the plates, in this apparent extension, I do not assert the existence of it as part of the structure of the crinoid. Figure 1c, on Plate XI., is magnified six diameters, the upper part of the illustration reaches the larger plates of the central part of the vault, while the side spinous plates are those following the waves toward the arm furrows.

It being definitely settled that the pinnules do not cover the arm furrows, the question very naturally suggests itself as to whether or not they had any connection with them. If they were perforated they had communication with the arm furrows, and if they were not perforated, they did not. Prepared microscopic sections would, probably, settle this question, and I will let it remain unanswered until some one prepares such sections.

The surface of the calyx, in this species, is ornamented with strong radiating ridges, from the center of each plate, in the lower half, so as to form triangular depressed areas, which become less conspicuous in the middle part, and fade away in the intertertiary areas.

Found in the middle part of the Hudson River Group.

GLYPTOCRINUS DYERI (Hall).

G. dyeri is distinguished from *G. decadactylus* by having a bowl-shaped calyx below the secondary radials, and rather less prominent ridges; by having 12 to 15 by 10 secondary radials, instead of 2 by 10, and consequently an increased number of intersecondary plates; the interradi al and intersecondary radial areas are not so much depressed; there are no tertiary or intertertiary areas; the arms bifurcate and become free at the top of the vault. Prof. Meek said, the second and fourth secondary radials—

"Give off alternately on each side small divisions, that do not become free, but are soldered into the interrarial walls, though they can be traced to the summit of the body, where they merely give origin to pinnules."

This was a mistake.

Quite a strong ridge arises from the second secondary radial, and passes upward across the interrarial plates, gradually diminishing in size and disappearing at the plates of the vault; a similar, smaller ridge arises from the fourth secondary radial, and passes upward across the interrarial area. These ridges appear to have been supports to the interrarial areas, as the central ridge in the wider azygous area seems to have been a support to it, but they are not soldered into the interrarial walls any more than the ridges that ornament the surface of the plates, and produce the sculptured appearance of the calyx are soldered to the walls; nor do they support arms, or pinnules. The azygous areas in the two species are similar, and the arms in this one are a little more delicate than in *G. decadactylus*. The two species agree in the general characters of the column, basals, primary radials, and number of arms; but differ materially in the region of the secondary radials, though the number of secondary radials and tertiaries, forming part of the calyx in *G. decadactylus*, will nearly correspond with the number of secondary radials, forming part of the calyx in *G. dyeri*.

It occurs in the middle part of the Hudson River Group, above *G. decadactylus*.

GLYPTOCRINUS SUBGLOBOSUS (Meek).

G. subglobosus was described by Prof. Meek as a variety only of *G. dyeri*, with which it agrees in the most essential parts of its structure, but, as so many specimens have been collected, and they are so easily recognized, I think it should rank as a species.

It is distinguished by having proportionally a larger column, and proportionally larger, though not longer, arms, which are also more divaricating or spreading. The interrarial areas are more depressed, and the calyx more pentagonal in outline. The longitudinal ridge or support in the middle of the azygous interrarial area is stronger, and extends higher up toward the vault, accompanied by the proportionally larger size of the plates.

It occurs in the central part of the Hudson River Group.

GLYPTOCRINUS PARVUS (Hall).

G. parvus is quite similar to *G. decadactylus*, but distinguished by being small, and having proportionally a shorter body, and fewer tertiaries and intertertiaries; the arm plates are proportionally longer, pinnules stronger, and sculpturing of the calyx less marked. It is so much like *G. decadactylus* that very few specimens have been distinguished.

It occurs at the base of the Hudson River Group.

GLYPTOCRINUS SCULPTUS (S. A. Miller).

G. sculptus is distinguished from *G. decadactylus* by having 3 by 10 secondary radials instead of 2 by 10. Other differences relating to form and ornamentation have been pointed out.

It occurs in the upper part of the Hudson River Group.

GLYPTOCRINUS MIAMIENSIS (S. A. Miller).

G. miamiensis is much farther removed from *G. decadactylus* than either of the above contrasted species; but it agrees in the general character of the column, number and position of the basals and primary radials. It is distinguished by being devoid of all sculptured, angular and radiated ornamentation, and by the number and irregular divisions of the radial series, having as is supposed only sixteen arms. One series has three secondary radials, supporting tertiary radials, or giving rise to four arms, another has tertiary radials on one side, and not on the other, giving rise therefore to three arms, while another has no division following the secondary radials, and therefore gives rise to only two arms. The arms are long and pinnule bearing as usual in the genus.

It occurs in the upper part of the Hudson River Group.

GLYPTOCRINUS RAMULOSUS (Billings).

G. ramulosus has a bowl-shaped calyx, five basals, 3 by 5 primary radials, and 8 or 10 by 10 secondary radials. Billings, in describing this species, mentions only four secondary radials, but the specimen figured on Plate VIII., of Decade IV., of the "Canadian Organic Remains," shows that it possessed as many as eight, and a much injured specimen, in my own collection, shows it possessed at least that many. Twenty arms arise from the secondary radials, and as far as observed, each one bifurcates in a distance of from twenty to forty plates, so that

it bears forty arms. The radial ridges are moderately prominent. The interradial and intersecondary radial areas are slightly concave, and filled with medium sized smooth plates. The column is round, and distinguished by its thin, sharp-edged plates near the head, and the gradual separation below of the projecting plates until they are from one to three lines apart. This is a well marked species in the structure of the column, the arms, and in other respects.

It occurs in the Trenton Group.

GLYPTOCRINUS PRISCUS (Billings).

G. priscus, has a pentagonal, obconoidal calyx, with smooth plates. There are five basals of moderate size, and three by five primary radials, the first of which are very large. The number of secondary radials is not mentioned by Billings, but looking at his illustration one would infer there are four or more in each series. The radial ridges are prominent, and the interradial areas depressed. A longitudinal row of larger plates fill the central part of the azygous area, and bear a strong ridge that bifurcates on the first azygous plate, and sends one branch to each of the contiguous first primary radials. The column is round, with the larger plates rather thick, nodulose, and somewhat distant from each other. There are only ten arms composed of short plates, and bearing moderately long pinnules. This is a strongly characterized species.

It occurs in the Trenton Group.

GLYPTOCRINUS ORNATUS (Billings).

G. ornatus has a broad oval calyx, well rounded at the base. Each of the plates is ornamented with five or six sharp ridges, which radiate from the center, thus covering the body with numerous stars, with triangular spaces. There are five basals, three by five primary radials, and as near as I can ascertain from the specimens in my own collection, five by ten secondary radials. Billings does not mention the number of these plates. The interradial and intersecondary radial areas are slightly concave, and the plates are rather large, and not more numerous than they are in *G. decadactylus*. There are only ten arms. The column is round, and the larger plates thin and sharp-edged, and gradually become more distant from each other as they recede from the calyx. This is a beautiful, well marked species.

It occurs in the Trenton Group.

GLYPTOCRINUS BAERI (Meek).

G. baeri has five short pentagonal basals, three by five primary radials, and four by ten secondary radials. The radials are large, separated externally at the sutures, and stand out prominently from the calyx. The interrarial areas are deeply depressed, and each has twenty or more plates, each bearing a radiately sculptured tubercle, but without the connecting ridges, as in *G. decadactylus*. The intersecondary radial spaces bear six or more similar plates. The azygous area has a central longitudinal series of larger plates bearing a ridge which gradually tapers above as in other species. The column is round. There are only ten arms, these are very broad, strong, and composed of alternately arranged, thin, projecting cuneiform plates bearing long pinnules. The vault is similar to that of *G. decadactylus*. This is a strongly marked species, but unless generic characters are founded upon the number and structure of the arms, there is nothing to take it out of the genus *Glyptocrinus*.

It occurs in the upper part of the Hudson River Group.

GLYPTOCRINUS PATTERSONI (S. A. Miller).

G. pattersoni is a small species, with concave interrarial areas and angular outlines. Basals, five, very small. Primary radials, three by five. Secondary radials, three or four by ten, from the last ones of which the arms become free, and do not afterward bifurcate. This limits the number of arms to ten. Surface of the body, sculptured. Column, round. Arms and pinnules, in proportion to the size of the calyx, long and coarse.

It occurs in rocks of the age of the Utica Slate Group.

GLYPTOCRINUS ARGUTUS (Walcott).

G. argutus was described quite recently by Mr. Walcott in advance sheets of the 35th Rep. N. Y. St. Mus. Nat. Hist. It has five low basals; three by five primary radials, the first one being much the larger. Secondary radials, two by ten, as I infer from the figure and description. Arms, bifurcating at the fifteenth plate from the primary radials. Interrarial areas slightly sunken, and having six plates to the inturning of the vault. One plate in each intersecondary radial area. Surface of calyx, nearly smooth. Column, round and projecting plates having a denticulated border. From the Trenton Group, at Trenton Falls, New York.

GLYPTOCRINUS SUBNODOSUS (Walcott).

G. subnodosus was also quite recently described by Mr. Walcott in advance sheets of the same report. The calyx is ornamented by a node at the center of each plate, and by radiating ridges. There are five rather large basals; three by five primary radials; and three or four—as I infer from the figure and description—by ten secondary radials. The rays do not bifurcate after becoming free, which leaves this species with only ten arms. The interrarial areas are slightly depressed and occupied by twelve or fourteen plates to the commencement of the vault. There are three intersecondary radials. The column is round and proportionally large.

It is from the Trenton Group, at Trenton Falls, New York.

GLYPTOCRINUS RICHARDSONI (Wetherby).

G. richardsoni has a round column; five basals; three by five radials; and six or eight by ten secondary radials. The arms divide immediately after becoming free, and part of them divide the second time so as to make thirty arms. The interrarial and intersecondary radial areas are deeply depressed, and filled with numerous plates. The plates are convex or bear a central tubercle. The azygous area is strengthened by a series of large plates, bearing a strong ridge in the central part, which gradually fades away in its upward extension, and also by a ridge-bearing series, springing from the second secondary radials.

It occurs in the upper part of the Hudson River Group.

GLYPTOCRINUS FIMBRIATUS (Shumard).

G. fimbriatus is not very satisfactorily figured or defined, and I am, therefore, unable to make any comparisons with it.

It occurs in the Trenton Group.

GLYPTOCRINUS FORNSHELLI (S. A. Miller).

G. fornselli agrees with the species referred to *Glyptocrinus* in the number and form of the basals and primary radials, and in having secondary radials, but here the resemblance seems to cease. It is distinguished by having a pentagonal column, many bifurcations of the arms, and peculiar surface ornamentation. There is no ridge running up the primary and secondary series, but one commences on the third secondary radial, and rapidly swelling, stands out from the

body, a free arm, before reaching the top of the vault. The inter-radial and intersecondary radial areas are not depressed, nor the general obconoidal form of the body, interrupted except by the standing out of the arms above the second secondary radials. The arms bifurcate at once, upon becoming free, and three times afterward.

The character of the vault is unknown, but if its general structure is essentially distinct from other species of *Glyptocrinus*, the species must be referred to another genus.

It occurs in the upper part of the Hudson River Group.

GAUROCINUS, n. gen.

[Ety. *gauros*, haughty, proud; *krinon*, a lily.]

This genus is established to receive those species heretofore referred to *Glyptocrinus*, but which have basal and subradial plates. It may be defined as follows :

Column round or pentagonal, and composed of thinner and thicker plates. Calyx having strong radial ridges, and depressed interrarial and intersecondary radial areas. Basals, five, presenting a low triangular face on the exterior, or having slightly truncated lateral angles. Subradials, five, heptagonal, height and width subequal. Primary radials, three by five, or as in the type, the left posterior ray may have only two. Secondary radials, ten to sixteen by ten. Interrarial and intersecondary radial areas covered by numerous small plates. Azygous area supported by a ridge up the middle series of plates, gradually becoming obsolete as it approaches the vault. Vault, covered by numerous small plates, which are continued as a covering over the ambulacral furrows. Arms, twenty or more, possessing pinnules. Type, *Gaurocrinus nealli*, which will be particularly defined.

GAUROCINUS NEALLI (HALL).

Column sharply pentagonal, and composed of alternating thin and thicker plates. Basals, small, pentagonal, presenting a low triangular face on the exterior, slightly truncated at the lateral angles, and not interfering with the pentalobate character of the calyx when viewed from below. Subradials about as wide as high, except the one on the azygous side, which is longer than wide; each bears a semi-cylindrical three-rayed ridge, highest in the central part, and sending one arm below to meet the angle of the column, and one to each of the adjoining radials to meet corresponding ridges, except as to the azygous

subradial, which bears an additional depressed semi-cylindrical ridge extending upward to the superior truncated side. Primary radials, three in each series, except the left posterior ray which has only two. The first and last are pentagonal, and of almost the same size, form and ornamentation, so that by reversing ends they would nearly fill each other's places. Secondary radials, twelve to about sixteen in each series. The second one gives off a ridge that strengthens the interrarial areas. Azygous area covered by more than fifty plates, the middle row being larger and more prominent than the others up to about the sixth plate. Arms, twenty. Pinnules long.

It occurs in the upper part of the Hudson River Group.

GAUROCINUS COGNATUS (S. A. Miller).

G. cognatus is distinguished from *G. nealli*, by its more robust form, the plates of the radial series are proportionally larger, and those of the interrarial and intersecondary radial areas larger and less numerous. The radial ridges are not so prominent.

Only part of the head of this species is known, but it may be easily distinguished.

It occurs in the upper part of the Hudson River Group.

GAUROCINUS ANGULARIS (S. A. Miller).

The depression of the interrarial spaces gives to this species a strong angular outline, which is increased by the downward extension of the subradials below the junction of the column with the body. Radial ridges strong. Basals showing upon the exterior a low triangular outline. Subradials slightly longer than wide, and having a ridge which extends below into a cuneiform tubercle, and bifurcates above, sending a ridge to each of the adjoining radials. Primary radials three by five. Secondary radials two by ten, Tertiary radials three or four by twenty. Interradials twelve or thirteen to the top of the second secondary radials. Two or three intersecondary radials in each series following each other in line. The central row of plates in the azygous area are large, and slowly diminish in size before they are lost in the plates of the vault.

This is the same species described under the name of *Reteocrinus gracilis*, by Prof. Wetherby, some time after it had been described and illustrated as *G. angularis*.

It occurs in the middle part of the Hudson River Group.

GAUROCINUS SPLENDENS, n. sp.

(Plate XI., Fig. 3, Magnified three diameters. Fig. 3a, another specimen magnified four and a half diameters. The letter α points to a division of the third secondary radial that may be a fracture of the plate or a natural division.)

Column small, round, and composed of alternately thinner and thicker plates. Basals small, showing upon the outer surface a low triangular outline, slightly truncated laterally. Subradials large, hexagonal, longer than wide, and not truncated upon the upper face by an interradi al. Surface mounted by a strong semi-cylindrical ridge which bifurcates in the upper part, and sends an arm to the adjoining first radials, and extends downward like a tubercle below the point of union between the column and basal plates.

First primary radials about as large as the subradials, as long as wide, heptagonal. Second radials hexagonal, longer than wide. Third about the same size as the second, and not truncated by the axillary plate. Secondary radials three or four by ten, the arms not bifurcating at the top of the vault, but continuing, without bifurcation, to the twelfth or fourteenth plate.

First interradi al plate large, tuberculated, and followed by two smaller plates, and these by three, and so on to the top of the calyx, each bearing an elongated central tubercle. Intersecondary plates of the same character.

Pinnules directed straight from each side, showing that they do not cover the ambulacral furrows.

The calyx is elongated and strongly pentagonal. The radial series stand out in bold cylindrical columns, while the interradi al spaces are abruptly and deeply sunken.

This beautiful species was collected in the Trenton Group, at Cape Girardeau, Missouri, and is now in my collection.

GAUROCINUS MAGNIFICUS, n. sp.

(Plate XI., Fig. 2, Natural size.)

This is a robust species, readily distinguished from *G. cognatus*, by its prominent radial ridges. Column pentagonal, composed of thicker and thinner plates. Basals small, low, triangular on the outer face. Subradials longer than wide, ridge prominent. First and third primary radials of about equal size. Secondary radials four or five by ten; a ridge arises from the second one, which passes over the intersecondaries toward the vault. No tertiary radials. The arms bifurcate soon after becoming free, and four of them again bifurcate, so that the species

bears twenty-four arms. The first interr radial rests upon the superior side of a subradial, and it is followed by plates that are not disposed in transverse ranges. There are as many as twenty interr radials below the top of the second secondary radial, from which point the calyx seems to rapidly contract, leaving a very narrow vault. The vault is not known, but indications are that it is not materially different from that of *G. nealli*. The arms are composed of cuneiform plates. They are large and long, and bear strong pinnules which are separated, showing that the ambulacral grooves are covered with plates between the pinnules.

The calyx is strongly pentagonal, because of the prominence of the radial ridges. The sculpturing, if it had any, is not preserved in our specimens, and hence the surface markings of the plates are unknown.

It occurs in the upper part of the Hudson River Group, in Warren county, Ohio. The type of the species is from the collection of J. Kelly O'Neill, of Lebanon, Ohio, but Dr. D. T. D. Dyche, of the same place, has specimens also in his collection.

PYCNOCRINUS, n. gen.

[Ety.—*Puknos*, thick, from the dense pinnules; *krinon*, a lily.]

This genus is established to receive those species referred to *Glyptocrinus*, which do not possess any secondary radials. It may be defined as follows:

Calyx small, cup-shaped. Column round. Basals five, small, pentagonal. Primary radials three by five. Secondary radials, none. Regular interr radials three. Arms ten, but sometimes dividing after becoming free. Pinnules dense and strong.

Type *Pycnocrinus shafferi*.

PYCNOCRINUS SHAFFERI (S. A. Miller).

Column round, composed near the head of alternately thinner and thicker plates, but lower down, three, four or more thinner plates, intervene between the thicker projecting ones, presenting the appearance of a string of little spools, and finally the column terminates in a point. The lower end is sometimes found wrapped around another object, indicating that it was used in this manner, for the purpose of attachment.

Calyx small, cup-shaped, having an indistinct pentagonal outline, caused by a slight convex swelling of the radial series. Basals small,

pentagonal. Primary radials three by five. Regular interradials three. Azygous interradials about six or seven. Arms arising free from the third primary radials, and bifurcating at about the eighth or tenth plate after becoming free. Pinnules comparatively large and long. Surface very slightly ornamented. Vault moderately convex, and from appearances abutting upon the third primary radials, and extending up as a covering to the ambulacral grooves in the free arms.

It occurs in the middle part of the Hudson River Group.

PYCNOCRINUS GERMANUS (S. A. Miller).

This was first described as *Glyptocrinus shafferi* var. *germanus*, but I now regard it as sufficiently distinct to bear a specific name. Calyx, small, saucer-shaped. Basals, minute. Primary radials three by five, wider than long. Regular interradials three, the two upper ones being very small. Arms ten, as they arise free from the third radial. They bifurcate at about the twelfth plate after becoming free. Arms and pinnules, coarse and strong.

This species is distinguished from *P. shafferi*, by having a shorter calyx and much stronger and longer arms, which bifurcate at a greater distance from the calyx. The surface is without ornamentation.

It occurs in the middle part of the Hudson River Group.

The question may be asked, why should the presence of secondary radials be regarded as of generic importance, and not the presence of tertiary radials; or, in other words, if it is proper to found the genus *Pycnocrinus*, upon species having no secondary radials, why should we not have a genus limited to those having secondary radials as in *G. dyeri*, but not having any tertiary radials as *G. decadactylus* has? The answer is, because the tertiary radials are removed one step further from the stable part of the body toward the arms, where the bifurcations may not be uniform in different rays, and where the number of plates may differ, in different specimens, in the same species. There are greater variations, in the different species, in the region of the tertiary radials, than in the region of the secondaries. It would be a step from the region of greater stability to that of lesser stability, which is precisely the difference between a generic character and a specific one. All the species we have had under consideration have primary radials, and almost invariably three by five, and all have secondary radials, but widely differing in number, except these two, and these seem, otherwise, to be distinct, in important characters, from all the others. If the secondary radials were as uniform in

number, in the different species examined, as the primary radials, then a step from the secondary to the tertiaries might be as important as from the primaries to the secondaries, and the presence of tertiaries might well be regarded as of generic importance instead of specific. In other families this may be the case, and hence, a character of generic importance in one association of crinoids may not be in another. I do not, however, say that this is so, but others have asserted it as a fact, and I am not prepared to disprove it.

I have been unable to found generic divisions upon the interrarial or azygous plates. These do not reach the base or stable part of the body. In their upward extension they graduate into the plates of the vault, where the number differ, in different specimens in the same species. While the number is uniform in the interrarial areas proper, in each species, yet no two species will agree in the number and character of these plates; hence, they are of specific importance, or one grade less than generic.

COMPSOCRINUS, n. gen.

[Ety. *kompsos*, elegant; *krinon*, a lily.]

Column square or subquadrate. Basals four. Primary radials three by five; secondary radials two or more by ten; tertiary radials more or less numerous. One interrarial in the first series, two in the second, and above this, numerous. Intersecondary and intertertiary plates, numerous. Surface of the plates sculptured. Type *Compsocrinus harrisi*, described by the author in 1881, under the name of *Glyptocrinus harrisi*, in Jour. Cin. Soc. Nat. Hist., vol. iv., p. 74.

This genus agrees with *Xenocrinus*, in the general character of the column and number of basals, but above this it seems to be much like *Glyptocrinus*. At first view one would suggest that the type of this genus bears about the same resemblance to the type of *Xenocrinus* that *Glyptocrinus decadactylus* bears to *G. baeri*, but such is not the case. The two latter agree in the radial structure as high as the second secondary radials, and in the general character and structure of the vault, so far as ascertained; but *Xenocrinus* is possessed of an extraordinary azygous side, and a prolonged proboscis, while this genus has no such disproportion in its sides, and from what we know, appears to have had a vault without a proboscis. The characters will be more fully stated in the description of the species.

COMPSOCRINUS HARRISI.

[*Glyptocrinus harrisi*, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. iv., p. 74, Pl. I., figs. 4 and 4a.]

(Plate XI., Fig. 4, A flattened specimen, natural size, showing the separation of the radial plates at the sutures as in the type specimen. Fig. 4a, Diagrammatic view of the end of the column, basals and first primary radials.)

General form of the calyx, obconoidal, with flattened interradial, intersecondary and intertertiary areas. Radial ridges strong, and plates separated at the sutures. Surface strongly sculptured with star-like ornamentation in relief, or something like the sculpturing on *Glyptocrinus decadactylus*, though much stronger marked.

Column four sided, each side slightly concave, and the four corners rounded. This is its form at the head, and it is yet undecided whether or not it is round below.

Basals four, two pentagonal and two hexagonal, each about twice as wide as high, and deeply sculptured on the surface. The three primary radials are of about equal size. The two secondary radials are of about equal size, and about the same size as the primaries. There are eight tertiary radials in each series, which gradually diminish in size. There are twenty free arms at the vault. There is one plate at the base of the regular interradial areas resting between the first primary radials, it is followed by two plates, and above these there are two or three plates in each range to the top of the vault. The intersecondary areas have one or two plates in each transverse series, and the intertertiary plates follow each other in single order. The first azygous plate rests upon one of the four basals, and is the same size as the primary radials. It is followed by a series of rather large plates, upon each side of which there are nearly as many plates as in the regular interradial areas. The vault is unknown, but from the general form and structure of the body it is inferred that there is no proboscis, and this is one reason that the species is not supposed to be referable to the genus *Xenocrinus*. The upper part of the calyx resembles that of *Glyptocrinus*. The arms bear strong pinnules, but whether or not other bifurcations take place above the vault, is yet unknown.

The species is from the upper part of the Hudson River Group, near Waynesville, Ohio, and all the specimens I have seen belong to the collection of I. H. Harris, of that place.

DESCRIPTIONS OF FOSSILS FROM THE CINCINNATI GROUP.

By U. P. JAMES.

Genus LINGULA, Bruguiere.

LINGULA NORWOODI, James (Pl. X., fig. 1).

Lingula norwoodi, James. Cin. Quar. Jour. of Science, vol. ii., p. 10, Jan. 1875.

Shell long, suboval in outline; beak obtusely pointed; outward rounding slopes, rather sudden at first from the beak, then more gentle at the sides, to about $\frac{3}{4}$ ths of the entire length, where the curve is more abrupt but even around the front margin. Regularly and evenly convex transversely; surface marked by distinct but delicate concentric lines of growth. Length of the specimen used for this description a little over two lines, breadth about one line.

Found by the writer embedded in subcrystalline limestone on the left bank of the Ohio river, opposite the lower part of Cincinnati, about 30 feet above low water mark. Other specimens have been found similarly embedded, about the same average size, none larger.

Named in honor of Prof. J. G. Norwood, of Columbia College, Mo.

The object in republishing this species is to give a fuller description and better figure than the originals.

Genus MONTICULIPORA, D'Orbigny.

MONTICULIPORA DYCHEI, James (Pl. X., figs. 2, 2a, 2b, 2c, 2d, 2e).

Monticulipora dychei, James. The Paleontologist, page 52, Sept. 12, 1882.

The corallum of the type specimen of this species is subfusiform in general outline, with rough, nodular swellings, and low compressed ridges, and annular constrictions: *parasitic*, a crinoid stem the central, or subcentral object, upon and around which it is grown: tapering at each end to a little more than the size of the stem—about three eighths of an inch at one end, and one fourth of an inch at the other. When found, the specimen was broken into five pieces, exhibiting clearly the parasitic habit, the stem seen as passing entirely through, from end to end. The corallites radiate from the central object, and have a slight upward inclination at first, then curve directly in a slightly wavy course to the outer surface. Slightly raised, rounded monticules,

about one line apart from center to center, irregularly distributed over the surface, occupied by calices somewhat larger than the average. Margins of cell apertures thin and sharp: no interstitial tubes observed. Calices polygonal and averaging about eight to ten in the space of one line.

A microscopic section of the *interior* shows the tubes to be thin-walled throughout, of a somewhat duplex character, and *very few*, remote, indistinct tabulæ. A tangential section shows the angular calices and peculiar cruciform divisions in the tubes, which may be seen in some other species; no spiniform corallites noticed. A longitudinal section of a lateral projection shows the tubes springing from a medial axis, taking a sloping direction at first, then a wavy course to the surface, at nearly right angles.

The specimen used for this description is seven inches long, over two inches in diameter at the thickest swelling, and one half to three fourths of an inch at the narrowest constriction.

Found by Dr. T. D. Dyche, in company with the writer, near Lebanon, Warren Co., O. The only entire (apparently) specimen known to the writer, but many fragments of smaller examples have been collected at the same locality, and on the hill tops at Cincinnati. Named in honor of the discoverer.

The interior structure of this species resembles *M. sp. clavacoidea*, James, but in other features it differs widely in habit of outward growth and otherwise. The central object around which the tubes grow and radiate of *dychei* is a crinoid column, whilst in *sp. clavacoidea* it is the tapering end of an *Orthoceras*, or some similar form.

A question has been raised as to the central object in *clavacoidea* being an *Orthoceras*. The writer has specimens in his cabinet showing the Septa clearly, placing this feature of such specimens beyond doubt; in other specimens the organic structure of the *Orthoceras* has disappeared, and the space occupied by calcite or clay, or left as a vacant tube, but the outline remains, always more or less sharply tapering, corresponding with *Orthoceras*. The evidence is positive in some cases, and the reasonable inference strong in others, that the central object is *Orthoceras*.

OCCURRENCE OF THE BARN OWL.

By CHARLES DURY.

The American Barn Owl (*Strix flammea*) has always been very rare in collections of birds made in this vicinity. During the last 15 years I know of only three specimens being found; one male from near Wyoming, and one male from Carthage. Mr. Langdon, in list of birds of this vicinity, 1877, regarded its occurrence here as inferential, but in his later list, 1879, he mentions the two specimens above enumerated. Since then Mr. Markley shot an adult male at Foster's Landing, Ky., which is about 25 miles above the city. This is the only record we have of the occurrence here of this bird.

In October just past, Mr. Biggs observed several large birds fly out of the town hall in Glendale. Three of these were killed, and proved to be barn owls. Mr. Key's also killed one. On October 15th, I received two specimens, male and female, that had been killed near Jones' Station. In the stomach of one was a mouse, and in the other was an orthopterous insect, commonly called "Katydid," (*Cyrtophyllus concavus*). October 16th, Mr. Clifford Allen went to the town hall and placed a ladder up into the tower, and climbed up there. There were four owls on a beam looking down at him, one of these he shot. In this specimen, which was a female, was a nearly grown rat, from which the head had been bitten, and the body swallowed entire. Mr. Allen closed the trap door leading to the tower, and on the 18th I went to Glendale to examine the place. When Mr. Allen went up, four owls flew out, one of which was killed, a female. The stomach contained two mice. On going up into the tower, I was astonished at the sight presented. The floor and ledges were covered with the cast-up pellets of the birds. It is well known to ornithologists that all raptorial birds swallow much indigestible matter, which is formed into balls in the stomach, and afterwards cast up. These are called pellets. In this case they were by hundreds, and covered the floor several inches deep in places. I examined many of them, and found them made up entirely of the hair and bones of the smaller rodents, mostly mice. There must have been the debris of several thousand mice and rats. But the strangest part of the curious habitation was the flock of domestic pigeons that were living seemingly on intimate terms with the owls, and judging from the old pigeon nests, I presume the pigeons had actually nested and reared young there.

This seems to show the food of this owl to be almost exclusively mice and rats, and proves it to be a species of the greatest economic value. Since my visit to Glendale, Mr. R. T. Shepherd informs me that two of this species were taken near Monroe, Ohio. This makes a total of thirteen individuals on record, and removes it from the ranks of the rare or accidental species of the locality.

THE GIANT BEAVER (Castoroides ohioensis), Foster.

ANOTHER INCISOR TOOTH FOUND IN OHIO.

By F. W. LANGDON, M.D.

During a recent visit to Richmond, Indiana, I had the pleasure of inspecting a lower incisor tooth of the above mentioned animal, which merits notice as adding another specimen to the somewhat meagre list of fragments from which the species has heretofore been known to zoologists.

The specimen forms one of the attractions in the cabinet of Dr. J. W. Jay, of Richmond, Ind., who very kindly allowed it to be brought to Cincinnati for exhibition to the members of this society, and others interested in the subject. The doctor informs me that it was exhumed near Greenville, Darke county, Ohio, at a depth of four feet, in a swampy locality.

Its measurements are as follows: Greatest length along anterior curvature, $11\frac{1}{4}$ inches. Distance (straight line) from proximal to distal extremity, $8\frac{1}{2}$ inches.

In section it is triangular in shape, the outer surface curved. The dimensions of this triangular section, at about the centre of the tooth, are as follows: External (curved) border, $1\frac{3}{8}$ inch; internal border, $\frac{3}{4}$ inch; superior border, 1 inch.

The enamel on the external surface is black in color, and presents sixteen longitudinal ridges, each about 1 mm. in width, running the entire length of the tooth, and separated by grooves varying from 1 to 3 mm. in width; these grooves increasing in size from within outward somewhat regularly. The distal extremity presents a beveled surface superiorly, irregularly triangular in shape; the base of the triangle being formed by an abrupt shoulder, situated one inch behind or below the very obtusely pointed distal extremity. A fragment of the enamel,

about $2\frac{3}{4}$ inches in length, by $\frac{3}{4}$ of an inch in breadth, is missing from the middle third of the external surface; and the proximal extremity has been broken off irregularly, so that the original length can not be accurately ascertained; otherwise the specimen is nearly perfect, and in a fine state of preservation.

The exact length of the original specimen, described by Mr. J. W. Foster, in the Ohio Geological Survey for 1838, is $11\frac{1}{2}$ inches.

A list of the fragments of seven or eight specimens, from which the species is known, is given by Mr. J. A. Allen, in his "Monographs of North American Rodentia," *U. S. Geol. Survey*, 1877, vol. xi. Mr. Allen considers the animal to have been as large as a full-grown black bear, and states that it was probably contemporary with the Mastodon and Megatherium.

Dr. Jay informs me that, should he conclude to part with the specimen which forms the subject of this communication, it will probably grace the museum of Erlam College, at Richmond, Indiana.

CINCINNATI, October 9th, 1883.

IN MEMORIAM—VACTOR T. CHAMBERS.

VACTOR TOUSEY CHAMBERS, was born in Burlington, the county seat of Boone county, Kentucky, on the 6th day of August, 1830, and died at his residence, in Covington, Ky., on the morning of August 7th, 1883, from a stroke of paralysis, which occurred on the afternoon of his birthday, August 6th. His mother died when he was but eleven years of age, and his father, Mr. Charles Chambers, a lawyer by profession, and a gentleman of influence, culture and wealth, never remarried; but by his constant care and attention, endeavored, so far as was in his power, to supply the irreparable loss the son had sustained in the death of his mother. He received his early education at Morgan Academy, a then flourishing and excellent school near Burlington. At the close of his school life, he spent some two or three years in the study of law, under the tutorship of Hon. James Pryor, at that time Judge of the Judicial District, embracing Boone and Kenton counties. In the year 1852 he graduated at the Louisville Law School, and entered upon the practice of his profession. After a short residence, he, in 1854, removed to Covington, Ky., where he continued to reside until the time of his death.

Here, in 1857, he was married to Miss Nannie Pryor, who, with her

three sons, still resides in Covington. He was for several years alone in the practice of his profession. He was afterwards the partner of Gen. J. W. Fennell, and subsequently, for many years, up to the time of his death, the partner of Hon. James Pryor. He was a lawyer of ability, and we can but repeat the estimate put upon him by one who knew him in that relation. He gave careful and assiduous attention to business, and was faithful to all professional trusts which were committed to his keeping. In business he was a pleasant man to be in contact with, so just, so honest, so correct, so minute, so straightforward, so intelligent, that what he said might be relied on implicitly.

But Mr. Chambers' tastes were never in harmony with his profession, and its details and worry were to him irksome and unpleasant. He was naturally fond of reading and study. His library and scientific investigations afforded him a satisfaction that was more congenial to his nature than the wranglings of the court room. His information in all the range of general literature, and more especially in the departments of modern scientific research was broad and accurate. He was a profound student, and had a consuming passion for the study of nature, especially in the fields of entomology and botany. There was no higher authority in this country or in Europe than he, on the subject of the Micro-lepidoptera, those most exquisitely beautiful microscopic forms that he has so graphically and accurately described. He was never compelled by the *res angusta domi* to the uncongenial drudgery of pursuits that were merely for the purpose of money getting, but with Cicero, he firmly believed that,—“*Est animorum ingeniorumque nostrorum naturale quoddam quasi pabulum consideratio contemplatioque naturæ*”—“that the study of nature is the true food of the human understanding.”

Force has had its conquests, reason has had its victories superior to force, but genius accompanied by persistent effort, has accomplished through the sciences much that has elevated the human race to its present high estate. Nature gives a bias to one pursuit, the mind yields to it, yields heartily, yields wholly, gives up every power to it. This is genius; the mind follows its instincts, works according to its laws, seeks its success in the channel marked out for it by nature. It is native power, taste, fully and faithfully improved. It is the only genius to which the world owes anything great or good. That erratic thing called genius, which affects to be singular, and aims to be great without labor, is not genius, but presumption; conceit, with nothing of genius but its eccentricity. He was a genius in its truest sense. He was a true

disciple of nature, he worked for the *chaplet* and not for the *lucre*. He sought as his reward, truth, which if developed in any form will be for the betterment of the lives and hearts of our fellow men. He was an ever welcome contributor to the different scientific journals throughout this country and to foreign periodicals. As a writer on scientific subjects his style was marked by ease, culture and perspicuity. He never for got the amenities of life, even in the heated contests which he sometimes had in the severe field of science. In the fabled tournament of romance, it was not the muscular force of the Norman knight, nor the fiery spirit of the Templar, nor the brawny arm of Athelstan the Prince, but the skill, the courage, the well-practised arm of Cedric the Saxon, that won the day.

He was true in all the domestic relations of life. As a son, fulfilling the high command, "Honor thy father;" as a brother, sympathetic and kind; as a husband and father, affectionate to over indulgence. It was here that his character shone the brightest. We make the following extracts from the funeral discourse of his minister, Rev. J. T. Plunkett: "In his home no one knew better how to dispense hospitality. Many of us do remember his retiring manner, his modest grace, his genial welcome, the striking diffidence with which he brought forth fresh stores from his rich and varied knowledge for the pleasure and profit of those about him. Pre-eminently he possessed those qualities which caused him to bear, 'without abuse, the grand old name of gentleman.' He was particularly fond of the society of children. He was ever ready to give them information on any subject. It was his delight to take young people with him into the woods and fields and endeavor to interest them with the love of the pure and the beautiful." We can not refrain from making another extract from the same source. "I rise to speak, with no expectation of increasing the reputation of our departed friend. His life was spent among you; you all did know him. He was an epistle known and read of all men. When death comes, when it crushes the budding loveliness of childhood, or treads upon the bloom of youth, the natural grief we feel is aggravated because the event appears as untimely as it is severe, and we murmur that it contradicts the order of nature. But when the pale messenger lays his hands upon a life that had well nigh rounded out the years which experience and inspiration assign as the desirable limit of human life, when those years have been occupied with useful labor, rewarded by success, crowned by universal expressions of honor and sterling worth; when such a man lies down to his final repose, we

may grieve, but can not complain, the tears of affection may not indeed be kept back, but the voice of reason is silenced. To complain at the close of such a life, is to complain that the ripened fruit drops from the overloaded bough, that the golden harvest bends to the sickle. It is to complain of the law of our existence, to accuse the Creator that he did not make man immortal on the earth. For such a life all honor, praise and imitation, for such a death, sorrow and grief, but not complaint. Complain for him who has fainted by the wayside—complain for him who has failed—complain for the wasted and misspent life, but not for him. Complain for him who through his own fault omitted to employ the opportunities that were given him as a steward, but no complaint for him who, having glorified God and honored his generation, lies down to restful slumber. He received the Scriptures as the inspired word of God. His belief and doctrines were those of the Presbyterian church. While he was not conspicuous in religious matters, was yet consistent, and his influence was for good. His faith was as modest as his social character, and implicit as a child's."

With what more fitting words can we close this brief memorial, than to say: All who knew him, loved him; those who knew him best, honored and loved him most. The influences of his life even in time are eternal, the tomb can not enclose them. He was a man in whom intellectual culture, scholarly taste, modesty of demeanor, purity of character, and a blameless life, were so harmoniously blended that he will be honored wherever science is appreciated and genuine worth is respected. Farewell, brave and gentle heart, may you rest peacefully in the bosom of mother earth, to whom you were so devotedly attached, and may she cover thy body with the greenest of turf.

The following is as complete a list of his scientific writings as we have been able to obtain:

1. Our Fresh Water Entomostraca, vol. i., No. 1, 1874, Cin. Quar. Jour. of Science.
2. Prof. Frey of Zurich, and some American Tineina, vol. i., No. 3, Cin. Quar. Jour. of Science.
3. Notes and Errata on a former paper on Prof. Frey, and some American Tineina, vol. i., No. 4, Cin. Quar. Jour. of Science.
4. Tineina of Colorado, vol. ii., No. 4, Cin. Quar. Jour. of Science.
5. On the Tongue (*lingua*) of some Hymenoptera, vol. i., No. 1, 1878, Jour. Cin. Soc. Nat. Hist.
6. On the Pronuba Yuccasella (Riley), and the habits of Tineina, vol. i., No. 3, Jour. Cin. Soc. Nat. Hist. In this article he gives this

definition of an entomologist, "Entomologists are a waspish people, the aculeate hymenoptera of mankind."

7. Annual Address of V. T. Chambers, Esq., President of Cin. Soc. Nat. Hist. Subject—The Metamorphoses of Insects, as illustrated in the Tineid genus *Lithocolletis*, of Zeller, vol. ii., No. 2, Jour. Cin. Soc. Nat. Hist.

8. Description of some New Tineina, with notes on a few old species, vol. ii., No. 4, Jour. Cin. Soc. Nat. Hist.

9. Illustrations of the Neuration of the Wings of the American Tineina, and some new species, vol. iii., No. 4, Jour. Cin. Soc. Nat. Hist.

10. Some new species of Entomostraca, vol. iv., No. 1, Jour. Cin. Soc. Nat. Hist.

11. On the Antennæ and Trophi of Lepidopterous Larvæ, vol. v., No. 1, Jour. Cin. Soc. Nat. Hist.

12. In the Bulletin of the U. S. Survey, under Hayden, there are several contributions from his pen. 1st. Tineina from Colorado. 2d. Notes on a Collection of Tineid Moths, made in Colorado, by A. S. Packard, Jr., 1875. 3d. On the Distribution of the Tineina of Colorado. 4th. A Description of Tineina from Texas. 5th. Tineina and their food plants. 6th. An index of the described Tineina of the United States and Canada.

Papilio, vol. ii., p. 115.—"Tineidæ or Tineina."

Psyche, vol. ii.—Notes upon the American species of *Lithocolletis*, p. 81. On Larvæ of Tineina, especially of *Lithocolletis*, p. 137, Notes on previous article, p. 227.

Psyche, vol. iii.—Notes upon some Tineid Larvæ, p. 63. Further notes on some Tineid Larvæ, pp. 135, 147. *Nepticula pteliacella*, n. sp., p. 276.

Psyche, vol. iv.—The Classification of the Tineidæ, p. 71.

Canadian Entomologist, vol. iii., 1871. A new species of *Cemios-toma*, p. 23. *Micro-Lepidoptera*, pp. 54, 84, 108, 127, 146, 161, 182, 205, 221.

Vol. iv., 1872.—*Micro-Lepidoptera*, pp. 7, 25, 41, 65, 88, 106. On some Leaf Mining Coleoptera, p. 123. *Micro-Lepidoptera*, pp. 126, 146, 169, 191, 206, 221.

Vol. v., 1873.—*Micro-Lepidoptera*, pp. 12, 44, 72, 85, 110, 147, 173, 185, 229.

Vol. vi., 1874.—*Micro-Lepidoptera*, pp. 8, 49, 72, 96, 128, 149, 166, 197, 217. Tineina from Texas, p. 222.

Vol. vii., 1875.—Tineina from Texas, pp. 7, 30, 51, 73, 92, 105. Tineina from Canada, pp. 124, 144, 209.

Vol. viii., 1876.—Micro-Lepidoptera, p. 18. Tineina, p. 30. Correspondence on the method of Denuding the Wings of Lepidoptera, p. 39. Tineina, pp. 103, 135, 158, 171, 217.

Vol. ix., 1877.—Tineina, p. 13. Tineina from Texas, p. 22. Correspondence on the method of preserving Tineina for examination, p. 38. Tineina from Texas, p. 71. Tineina, pp. 108, 123, 145, 194, 206. Insects feeding on Gleditschia, p. 231.

Vol. x., 1878.—Tineina, p. 50. Micro-Lepidoptera, pp. 74, 109, 238.

Vol. xi., 1879.—Micro-Lepidoptera, pp. 5, 72, 89, 118, 125. Tineina, p. 143.

Vol. xii., 1880.—Some new species of Tineina from North America, p. 225.

Vol. xiii., 1881.—On the early stages of *Gracilaria stigmatella*, Fabr., p. 25. On a Larva of Mordella, p. 173. "On some North American Tineidæ, by Thomas, Lord Walsingham, F.G.S." (a review), p. 191.

Vol. xiv., 1882.—Notes on the Larva of *Bucculatrix ambrosiæfoliella*, p. 153.

He was honored by the Cincinnati Society of Natural History with the presidency, and also as Curatorship of Entomology.

The types of his new species of Tineina are deposited in the Museum of Comparative Zoology, at Cambridge, Mass., where he placed them so as to have them accessible to students at all times.

He was a thorough botanist and microscopist. His cabinet contains a very valuable collection of slides, illustrating the various departments of entomology and botany. His last work was upon Microscopic Botany, and he remarked a few days before his death, that he was doing the best and most valuable work of his life.

J. W. HALL, JR.

AMERICAN PALÆOZOIC BRYOZOA.

[Continued from Vol. vi., p. 168.]

ATACTOPORA, Ulrich, 1879.

(Jour. Cin. Soc. Nat. Hist., Vol. ii., p. 119.)

More recent and thorough investigations, and our more advanced and constantly increasing knowledge of these intricate Palæozoic Bryozoa, have shown me that this genus, as originally defined by me, included at least two, unequal, and in many respects widely different groups of species, besides a single species (*A. septosa*), which I have already referred to the genus *Amplexopora*. The type species, *A. hirsuta*, unfortunately, is a member of the smaller group, the only other described species certainly known to have the characters of the genus, as I now propose to restrict it, being the *A. maculata*, a description of which was published by me in the same paper above referred to. That my subsequent remarks may be the better understood, I will immediately subjoin the emended definition of the genus, to conform with the restriction proposed.

ATACTOPORA (Restricted).

Zoaria parasitically attached to foreign bodies, over which they form thin and expanded crusts, the thickness of which varies according to the number (rarely more than three) of superimposed layers, the latter having an approximately definite thickness. Zoœcia with more or less thick walls, and indented or floriform orifices, due to the position of the numerous spiniform tubuli, which in the thick-walled species are developed almost exclusively in the portion of the walls immediately surrounding the visceral cavity. True interstitial cells are wanting. At regular intervals the surface presents subsolid elevated "maculæ," that are granulose and finely pitted, and apparently composed of peculiarly modified or aborted cells. Diaphragms few, always horizontal.

As before stated, the type of the genus is *A. hirsuta*, the internal structure of which is represented on Plate XII., by figs. 1 and 1a. The first represents a portion of a tangential section, enlarged eighteen diameters, and shows very distinctly the characters of the species as they are brought out in a section of this kind. The cell-interspaces are thick, and the walls of adjacent tubes are apparently fused

together, there being no sharply defined lines of contact, though these are rather faintly indicated by an irregular and often confused central zone, of lighter color than that portion of the walls immediately surrounding the visceral cavity of the tubes. Their structure is on the whole quite like that of species of *Monticulipora*, but more like that of some species of *Amplexopora* (e. g., *A. septosa*, Ulrich, and *A. moniliformis*, Nich.)

Figures 2 and 2a, on the same plate, represent typical sections of *A. maculata*. Comparing fig. 2 with fig. 1, both representing tangential sections, cutting the zoarium just below the surface, we find that, with the exception of the relative thickness of the cell-interspaces or walls, the two species are precisely alike. In both we find the same peculiarly constructed "maculæ," while in the minute structure of the cell-walls no difference whatever is manifest. In their vertical sections a corresponding agreement of structure is apparent. So far as I have been able to ascertain, the layers of the zoarium of *A. hirsuta* never attain more than perhaps one half the thickness of a fully matured layer of *A. maculata*, while on the other hand, the cell walls of the former are usually about twice as thick as those of the latter. Aside from these specific points of difference, they agree in having remote horizontal diaphragms, and similarly constructed "maculæ." The latter are divided by more or less distinct floors, having an upward curvature, corresponding to the convexity of the outer or exposed portion of the elevated "maculæ." Not infrequently, on the upper side of these floors, some conical hollow projections may be detected, which doubtlessly represent modified spiniform tubuli, or structures of similar value. These do not appear to be continuous from one floor to the other, but the evidence at hand seems to establish as a fact, that each series is separately developed at the successive stages of growth. Further, in many specimens the zoarium is divided into three, rarely four, distinct layers, of very nearly equal thickness, separated from each other by parallel bands of sclerenchyma, that, usually, do not seriously interrupt the further growth of the zoarium, not the direct sequence of the cells.

Of the other forms originally referred by me to *Atactopora*, I now feel satisfied that *A. mundula*, *A. multigranosa*, *A. tenella*, and *A. ortonii*, Nicholson, belong to an entirely distinct genus. To this list I add three new species, so that the genus as at present known, is represented by at least seven distinct species. All of these are from the Cincinnati group, in which the genus is found to range throughout

the formation. The range of each species is however very restricted, being in perhaps no case more than one hundred feet, and usually much less. The genus may be characterized as follows:

ATACTOPORELLA, n. gen.

Zoaria usually incrusting, sometimes lobate, rarely sub-ramose, and generally composed of several superimposed layers. Surface always presenting more or less distinct groups of cells slightly larger, or with wider interspaces than the average, which usually occupy the slopes of more or less elevated, rounded or conical, monticules. Zoëcia tubular, rounded, with more or less distinctly petaloid apertures, due to the inflection of the thin walls, by the numerous spiniform tubuli. Interstitial cells numerous, angular, often completely isolating the true cells. As the layers become mature they are usually filled between the crowded horizontal diaphragms, by a deposit of sclerenchyma. Beside a limited number of straight diaphragms, nearly all of the proper zoëcia are provided with a series of cystoid diaphragms.

Type, *Atactoporella typicalis*, n. sp.

As may have been gathered from the above description, the new genus differs from *Atactopora*, as before restricted, in having numerous closely tabulated interstitial cells, cystoid diaphragms in the proper zoëcia, and thin, instead of thick walls. These are all good generic characters, and serve to remove the genus perhaps farther from *Atactopora* proper, than from either *Monticulipora* or *Peronopora*. *Monticulipora* differs in having no true interstitial cells, while the spiniform tubuli are mainly restricted to the angles of the cells, and only very rarely inflect the tube-walls. In *Peronopora*, however, we have a nearer ally, and it is unquestionable that the true affinities of *Atactoporella* lie in that direction. In both we have interstitial cells, spiniform tubuli, and cystoid diaphragms. On the other hand, the difference in their habits of growth, the zoarium of *Peronopora* being doubled-leaved, and perhaps, occasionally, frondescent, while that of *Atactoporella* is constantly more or less parasitic, the thicker and somewhat differently constructed cell-walls, and less numerous spiniform tubuli of *Peronopora*, are characters that serve to distinguish all the species of the two genera so far known. I can not admit that the fact that the zoarium of both *A. typicalis*, and *A. newportensis*, occasionally assumes a sub-ramose character, in any way nullifies the point of difference in growth, regarded by me as one of the characters separating the proposed genus from *Peronopora*. The few specimens

of those species found in that condition, are so variable in shape, that they can not be regarded as properly ramose or frondescent. I hold that in all truly ramose or frondescent species of the TREPOSTOMATA, the zoarium is permanently either one or the other, and I have never observed such a vacillation of form as pertains to these aberrant specimens of the two species mentioned. We have an entirely parallel case in Nicholson's var. *molesta* of the typically massive species *Monticulipora mammulata*. As I have in another place pointed out, that variety usually assumes a frondescent habit of growth, though individuals of the variety vary extremely in outward form. All these forms differ from truly ramose and frondescent types of the *Monticuliporidae*, in having both cystoid diaphragms and spiniform tubuli already present in the axial region of the zoarium.

One character of the genus, the importance of which I am at present not yet able to estimate, is developed in an unmistakable manner in at least the three species, *A. multigranosa*, *A. mundula*, and *A. ortonii*, viz: the secondary deposit of sclerenchyma in the interstitial tubes, and their partial suppression. In the young stages of these species the intertubular spaces are much thicker than they are in the fully matured stage, and the mouths of the interstitial cells can often be detected. Sections prepared from fully matured examples, demonstrate that the interstitial tubes in the deeper levels of the zoarium are open, and of considerable size, their diameter often equaling that of the proper zoecia. As growth proceeds, the interstitial spaces are narrowed, and a deposit of sclerenchyma around the outer side of the true zoecia, gradually fills them up, until in the fully matured state they can scarcely be detected any longer. Among the *Monticuliporidae* I am not acquainted with any form, excepting, perhaps, *Trematopora*, in which a similar filling up of the interstitial cells occurred. Among the *Fistuliporidae*, however, a similar condition is often present, but how nearly they may be due to the same causes, I am not prepared to say.

ATACTOPORELLA TYPICALIS, n. sp. (Pl. XII., figs. 3-3d).

Zoarium, in its typical condition, forming thin parasitic expansions over other bryozoa, having a thickness rarely exceeding .03 of an inch, and then only by the addition of another layer. A few specimens are lobate, and by an excessive development of the lobes, they have become, to a small extent, subramose. At rather unequal intervals, averaging perhaps .1 inch, the surface exhibits groups of cells slightly larger

than the ordinary, which may be raised into low, rounded monticules, or remain on a level with the surrounding plane of the surface. Cells regularly arranged in diagonally intersecting lines, about twelve in the space of .1 inch, separated by interspaces, usually of less width than the diameter of their orifices, which averages about $\frac{1}{150}$ th of an inch. When in a good state of preservation (Pl. XII., fig. 3), the cell apertures are distinctly floriform, the wall at each of the indentations, being raised into a small spine, representing the surface extension of the spiniform tubuli. Interstitial cells numerous, but not readily recognized externally, being shallow, and much obscured by the spiniform tubuli.

Tangential sections (Pl. XII., figs. 3*a* and 3*b*) show the characters of the genus and species in an excellent manner. The cell walls are very thin, and those of the true zoecia are more or less strongly indented at from two to five points in their circumference; the indentations are made most distinct by the spiniform tubuli, one of which occurs at each point, where it is developed, in nearly all cases, almost entirely upon the inner side of the wall. Surrounding, and usually completely isolating, the true cells, is a single, rarely double, row of small angular interstitial cells, with thin and rather faintly marked divisional walls. They are generally about half the size of the proper zoecia, and where three or four of them join, a spiniform tubulum appears always to have been developed, but I have never detected these structures in their walls between the angles. Lastly, the majority of the proper zoecia show the cut edges of the cystoid diaphragms.

Vertical sections, when cut from one of the typical incrusting examples, are identical with what may be called the peripheral portion of the section represented by figure 3*c*, on Plate XII. All the tubes have equally thin walls, but the two kinds are readily distinguished from each other by their relative size and tabulation. In the interstitial tubes, which first come into existence a short distance above the attached epithelial base, the diaphragms are crowded, and always horizontal. In the larger true zoecial tubes, a series of rather large cystoid diaphragms is usually present along the concave wall; while, as is nearly always the case in forms of this character, the space intervening between the inner margin of this series and the opposite wall, is crossed by equally numerous straight diaphragms. The intervals between the diaphragms of the smaller tubes are about half as long as those separating these partitions in the larger tubes.

Figure 3*d* represents a specimen in which the free condition of the zoarium is more distinct than in any other seen. However, in the ex-

amples before me, there is a regular gradation from this specimen down to what is nothing more than a pronounced node, and after a careful examination of these specimens, I find that this habit of growth is, apparently, always due to a lack of surface over which the zoarium might spread in its normal fashion. The direction of growth in the examples in question is, in every instance, toward the end of the branch of the ramose bryozoan incrustated. As growth proceeded, the foreign branch was gradually left behind, and in consequence, the tubes in the central portion of the zoarium are forced to remain in an "immature" condition for a much longer time than is the case in the normal parasitic condition. It is true, that with only a few exceptions, all the ramose and frondescent bryozoa are attached to some foreign body by a more or less expanded base; and I am fully persuaded that, what I must now regard as aberrant forms of *Atactoporella*, are clearly predictive of truly ramose or frondescent species of like character.

This species differs from all the other species of the genus now known, in its greater regularity of cell structure, and more numerous interstitial tubes.

Formation and locality: Cincinnati Group. Rather rare in the lower 100 feet of strata exposed at Cincinnati, Ohio, and Covington, Ky.

ATACTOPORELLA NEWPORTENSIS, n. sp. (Pl. XII., figs. 4-4b).

Zoarium robust, growing upon foreign objects, lobate, or throwing off subramose shoots. At intervals of about .12 of an inch, measuring from center to center, the surface is elevated into more or less prominent, rounded, and often elongated monticules, the summits and slopes of which are occupied by cells a little larger than the average. Cells rather regularly arranged in intersecting series, from eleven to thirteen of the ordinary size in the space of .1 inch, with subcircular or ovate apertures, having an average diameter of $\frac{1}{150}$ th of an inch. On finely preserved examples the apertures are surrounded by a slightly elevated rim or peristome, which is often a little inflected at the points occupied by the numerous, though very small, spiniform tubuli. Interstitial cells numerous, but as usual with species of this genus, they are not readily detected externally.

Internally this species is in many respects precisely like *A. typicalis*. In tangential sections (Pl. XII., fig. 4a) the cells are seen to be somewhat unequal, narrower, the walls less inflected, and the spiniform tubuli smaller than in that species. Externally they differ in their

surface markings, the zoarium of *A. typicalis* being prevalently entirely smooth, while that of *A. newportensis* is generally strongly tuberculated, besides being of more robust growth. The cell apertures also are never so distinctly petaloid as in the type species.

The relations between *Atactoporella* and *Trematopora*, suggested by such a specimen as is represented by figure 4, on Pl. XII., will be discussed a few pages hence, under the emended definition of that genus.

Formation and locality : Cincinnati group. I have examined about twenty-five specimens of this species, all of which were obtained from the shaly beds, near the southern line of the city of Newport, Ky. The height of these strata is perhaps 125 feet above low water mark in the Ohio river.

ATACTOPORELLA SCHUCHERTI, n. sp. (Pl. XII., figs. 5-5b).

Zoarium parasitically attached to shells and other foreign bodies, over which it forms thin irregular expansions, usually less than an inch in diameter, and rarely more than .03 of an inch in thickness. The surface generally exhibits at intervals of .1 inch or more, slightly raised eminences. When in a good state of preservation (Plate XII., fig. 5), the cellular structure is almost entirely obscured by the innumerable surface extensions of the large spiniform tubuli, in many of which the perforation at the apex is clearly shown. When worn, the cell apertures are rounded, about ten in .1 of an inch, with thick inter-spaces, occupied by the shallow calices of numerous interstitial cells, which in old examples are not readily detected.

The distinctive characters of the species are well brought out in tangential sections (Pl. XII., figs. 5a and 5b). The cell walls are thin, and between the numerous and large spiniform tubuli, are of about equal thickness throughout. Excepting when the section cuts the zoarium just beneath the surface, it is difficult to discriminate between the interstitial cells and true zoëcia. But, when near enough to the surface, the former are mostly filled with transparent calcite, while the latter are filled with particles of the surrounding matrix, and when this fails they may be more certainly distinguished by the possession of the crescentic edges of the cystoid diaphragms. The interstitial cells are numerous, but very unequal in size ; as a rule, they completely isolate the true cells. The arrangement, size and character of the spiniform tubuli are well shown in the figures referred to.

In vertical sections, unless they follow the direction of the growth of the colony, the same difficulty of distinguishing the interstitial from

the true cells is experienced. This is mainly due to two reasons. First, the cystoid diaphragms, a series of which is apparently developed in each of the proper zoecial tubes, are always attached to the concave side of the tube, and unless the section passes along the direction of growth, these diaphragms present the same appearance that those of the ordinary straight kind do. Secondly, we find that the horizontal diaphragms of the interstitial tubes, are but little, if at all, more numerous than the cystoid diaphragms of the true zoecia. There is one feature, however, by means of which I believe the two sets of tubes may be at all times distinguished: namely, the interstitial tubes are crossed by diaphragms at regular intervals throughout their length, while the true cells, near their apertures, are always filled by the surrounding matrix. The spiniform tubuli are very conspicuous in these sections, and nearly always show the central lucid line, which in several instances appears to be crossed by numerous horizontal partitions.

This species differs from all the others of the genus known to me, in the size and prominence of the spiniform tubuli. Compared more critically with *A. mundula* (Pl. XII., figs. 6 and 6a), we find the following differences. In that species the spiniform tubuli are considerably smaller, and less prominent, the intertubular spaces narrower, and, in consequence, the interstitial cells smaller, and less numerous, while the diaphragms in the interstitial tubes are about twice as numerous in a given space.

Named in honor of my esteemed friend, Mr. Charles Schuchert, who kindly gave me, among other interesting forms, a large and most beautifully preserved example of this species.

Formation and locality: Examples of this species are rather rare in the upper beds of the Cincinnati group, but occur perhaps at most the localities exposing these layers. The best specimens, however, were obtained from near Oxford, O.

ATACTOPORELLA MUNDULA, Ulrich (Pl. XII., figs. 6, 6a).

Atactopora mundula, Ulrich, Jour. Cin. Soc. Nat. Hist., vol. ii., p. 123, Pl. XII., figs. 4, 4a, Oct. 1879.

Zoarium attached to foreign objects, such as *Heterotrypa frondosa*, D'Orb., and *Ptilodictya pavonia*, D'Orb., forming irregularly outlined expansions, usually less than one inch in diameter, that, only when the colony consists of more than one layer, have a thickness exceeding .04 of an inch. Surface exhibiting at rather regular intervals of about .1 inch, more or less prominent monticules, on which both the cells and

interstitial spaces are slightly wider than ordinary. Cell apertures rounded, with more or less inflected margins, and somewhat unequal interstitial spaces; twelve to fourteen may be counted in the space of .1 inch; they are arranged in intersecting series, but these are not so regular as in most of the other species. Interstitial cells numerous, though, with the exception of a few instances in the monticules, they never completely isolate the true cells. Spiniform tubuli small, numerous, and apparently only developed on the margins of the true cells.

Tangential sections (Pl. XII., fig. 6) show that the true cells have thin walls, that they are always in contact at one or more of their sides, and occasionally on all sides, that from three to six spiniform tubuli, of moderate size, surround each aperture, and that these structures are not developed in the interstitial spaces, but only within the walls of the proper zoëcia, which, furthermore, are always more or less inflected at each point of their occurrence. The interstitial cells can not always be recognized, as they are often filled, especially just below the surface of fully matured specimens, by a secondary deposit of sclerenchyma. When not so filled, they can be, plainly enough, seen to occupy all the interstices between the thin walls of the true cells. Lastly, the crescentic edges of cystoid diaphragms may be detected in all sections of this kind.

Longitudinal or vertical sections (Pl. XII., fig. 6a) show that the true tubes in their initial stages are prostrate, and that, as soon as they begin to assume an erect position, the interstitial tubes, and spiniform tubuli make their appearance. The walls are thin, and near the surface have a peculiar granular appearance (the same as is found in a number of other bryozoa), for which I am not yet able to offer an explanation, unless it should indicate a porous condition of the walls. Numerous horizontal diaphragms cross the interstitial tubes. Beside a short series of cystoid diaphragms, which may be detected in most of the proper zoëcia, a few straight diaphragms are also present. When the colony consists of more than one layer, the characters above described are repeated in each.

By comparing this description, and those following, of *A. multigranosa*, Ulrich, and *A. ortonii*, Nicholson, with my original ones (*loc. cit.*), several differences will be noted. These may or may not be excusable, as they are mainly due to the fact that I was at that time not ingenious enough to prepare satisfactory sections of these thinly expanded bryozoa. Had I done so, I certainly would not have stated that interstitial tubes were entirely absent in *A. multigranosa*, and *A. ortonii*,

as I now know, having since been very successful in preparing sections of these forms, that such cells are numerous present in both of those species. I would also have better understood the relations of what I then called pseudo-septa,* as I could not have failed to see that they are produced by the projection of the spiniform tubuli into the visceral cavity of the zoœcia.

Formation and locality: Cincinnati group. Not uncommon on the hills back of Covington, Ky., and Cincinnati, O., at an elevation of from 300 to 325 feet above low water mark in the Ohio river.

ATACTOPORELLA MULTIGRANOSA, Ulrich (Pl. XII., figs. 8, 8a).

Atactopora multigranosa, Ulrich, Jour. Cin. Soc. Nat. Hist., vol. ii., p. 122, Pl. XII., figs. 1, 1a.

Zoarium usually attached to species of *Orthoceras*, often consisting of several layers, when the whole surface may become irregularly undulating, or even lobate. The maximum thickness of each layer is about .06 of an inch. In younger specimens the surface is studded with small conical monticules, quite regularly arranged in series, at distances apart of about .08 of an inch, measuring from center to center. In older examples the regularity of their arrangement is somewhat impaired by the general inequalities of the surface. In all, the monticules carry cells with apertures but slightly, if at all, larger than those of the ordinary size, but the interstitial spaces are always appreciably thickened, and for that reason, when a little worn, the monticules appear to have subsolid apices. The cell structure in young and fully matured examples is quite different. In the new layers and young specimens generally, the interspaces between the cell-apertures are considerably wider than they are in the matured layers, being quite solid, and comparatively thin in the latter. This is due to the fact that the interstitial cells are to a great extent suppressed, and filled up by a deposit of sclerenchyma, just as the zoarium enters the fully matured stage. In all cases the interstitial cells are either not at all to be detected, or they are very much obscured by the excessively numerous and very small spiniform tubuli. The cell-apertures are more or less floriform, and arranged in tolerably regular series; about twelve may be counted in the space of .1 inch.

A tangential section before me, shows several gradations between

* By using this word without quotation marks I supposed that I would be understood to mean, simply vertical ridges, that were false, so far as they simulated either the true septa, or the "pseudo-septa" of the *Calenterata*.

the two extreme phases above noted. Just after the cells assume an erect habit, they have a thin complete wall, and are separated from each other, often completely, by large interstitial cells. As the section gradually passes into more superficial regions, the cell walls seem to thicken, but, as a closer inspection will prove, it is done entirely at the expense of the interstitial cells, the secondary deposit being made upon the outer side of the walls of the true zoëcia, until, just below the surface, the interstitial spaces having at the same time also become narrower, they (the interstitial cells) can only with difficulty yet be recognized. The true cells are somewhat irregular in outline, of unequal size, and when cut at a level deep enough, always show the curved edges of the cystoid diaphragms. Except in the earlier stages of the zoarium, the spiniform tubuli are very numerous, and increase slightly in size with age. Figure 8a, on Plate XII., represents a portion of the section intermediate between the two extremes.

Vertical sections (Pl. XII., fig. 8) show that the tubes at first are prostrate, with thin walls, and a few straight diaphragms. As they assume an erect position, the interstitial tubes are developed, and if these are not too compactly filled by the secondary deposit, numerous, though not crowded, horizontal diaphragms will be observed in them. When, however, the filling is compact, the cell tubes have the appearance of being provided with walls of very unequal thicknesses. Short series of cystoid diaphragms, and a few straight ones, are present in nearly all of the true zoëcia. The spiniform tubuli are easily recognized in well prepared sections of this kind.

This species is in many respects closely allied to both *A. mundula*, Ulrich, and *A. ortonii*, Nicholson. From the first it is distinguished by its more robust zoarium, more compact monticules, more hirsute intertubular spaces, and less closely tabulated, but more compactly filled interstitial tubes. Nicholson's species is distinguished by its more delicate zoarium, thicker interstitial spaces, more oblique, and regularly arranged cells. Each of the three species is persistent in attaching itself to some particular class of objects. Thus, all of my specimens of *A. multigranosa*, are fixed to the shells of *Orthoceras*; those of *A. mundula*, grow upon other bryozoa of ramose or frondescent form; while those of *A. ortonii*, are all attached to some brachiopod, and in nine cases out of ten, the shells of *Strophomena alternata*, Conrad, have been selected.

Formation and locality: Cincinnati group. This is a rare species, and seems to be restricted to a few feet of strata, having an elevation

of about 425 feet above low water mark in the Ohio river, at Cincinnati, O. My best specimens I found in equivalent strata at Hamilton and Morrowtown, O.

ATACTOPORELLA ORTONI, Nicholson (Pl. XII., figs. 7, 7a).

Chetetes ortonii, Nich., Quar. Jour. Geol. Soc., vol. xxx., p. 513, Pl. XXIX., figs. 15-15b, 1874; Pal. Ohio, vol. ii., p. 211, Pl. XXII., figs. 3-3b.

Monticulipora (Peronopora) (?) ortonii, Nich. The Genus *Monticulipora*, p. 228, Pl. III., figs. 4, 4a, 4b, and 4d (not 4c).

A detailed description of the external characters of this well-known and beautiful little species is unnecessary, and I would do no more than simply mention it as an undoubted member of this genus, were I better satisfied with the way in which Dr. Nicholson has worked out its internal structure. He does not mention interstitial cells, although in all of my sections of the species, I find more or less clear evidences of their having been present in large numbers. It is true that they are generally partially filled by a deposit of sclerenchyma, which, possibly, in some cases, may have been so dense as to obliterate all traces of the numerous horizontal diaphragms which my sections clearly show. I make no objection to his figure of a tangential section, since in most sections in which the fully matured characters of the zoarium, just below the surface, are laid bare, the interstitial spaces are, from all appearances, compact. In a few tangential sections, however, I was enabled to determine with certainty the outlines of the rather large and angular interstitial cells. These were always shown to better advantage in the monticules (Pl. XII., fig. 7) which appear to be mainly occupied by them. The true zoecia have, in reality, very thin walls, which, so far as my observation has extended, are never thickened inwardly. The same is true of perhaps all of the species of *Atactoporella*, and in this peculiarity the genus seems to be unique, as I have never noticed such a character in any other of the numerous forms of the *Monticuliporidae*.

In his work on "The Genus *Monticulipora*," Dr. Nicholson claims to represent a vertical section of this species, on Plate III., to which I must object. The figure in question (4c), if it is at all a fair reproduction of his section, almost certainly belongs to some other bryozoan, perhaps to a species of *Leptotrypa*. I therefore can understand why he should complain in the text of not being able to find cystoid diaphragms in his vertical sections. He could not have failed to see them had he such a section before him, as my vertical sections, which, by the way, are invariably cut from the same specimen that furnishes the tangential

section, show, that with only a few exceptions, all of the true zoëcia have the concave wall lined with a more or less complete series of them. By comparing his tangential section, represented by fig. 4*b*, with fig. 4*c*, I think it will be seen at a glance that they have nothing in common. Aside from the absence of cystoid diaphragms in fig. 4*c*, they differ so widely in the thickness of their intertubular spaces, that I am surprised at its being overlooked by so acute an observer as Dr. Nicholson has often shown himself to be. My vertical sections further show (Pl. XII., fig. 7*a*), that the zoarium often consists of two layers, each with a maximum thickness of .02 of an inch or less. In some parts of a section, especially where it passes through one of the monticules, the spiniform tubuli, and the horizontal diaphragms in the interstitial tubes, have a peculiar intermittent, almost beaded appearance. Such an appearance is also exhibited by other *Monticuliporidae*, but I can not, as yet, offer an explanation. Besides the cystoid diaphragms, one or two straight ones are usually present in each of the true cells.

Formation and locality : Cincinnati group. This is the only comparatively common representative of the genus. It is restricted to the beds marking the tops of the hills about Cincinnati, and seems to occur at all localities where those or equivalent strata are exposed.

TREMATOPORA, Hall, 1852.

This genus, as it was originally defined in the Pal. N. Y., Vol. II., p. 149, and as Prof. Hall and other authors still use it, is an unwieldy and heterogeneous assemblage of forms, comprising, at the present day, representatives of no less than four distinct genera. The author not having designated a particular species as the type of the genus, I will regard the first species following the generic diagnosis, as the typical one. This course is the one usually adhered to, and, in my opinion, is the only justifiable one in such cases. Having made three series of sections from authentic specimens of *Trematopora tuberculosa*, Hall, I think I am prepared to furnish a clear definition of the genus as typified by that species.

TREMATOPORA, Hall (Emend. Ulrich).

Zoaria ramose, branches solid, sometimes tuberculated, generally smooth. Cells of two kinds, the true zoëcia marked by oval or sub-circular apertures, and a more or less elevated peristome. The interstitial cells are numerous, sometimes completely isolating the true cells ; in the best preserved mature examples, their apertures, the out-

lines of which are, however, often indicated by shallow depressions, are covered by a minutely perforated interstitial membrane, which, when the zoarium is but slightly abraded, gives the intertubular spaces a subsolid appearance. Spiniform tubuli of moderate size are developed more or less numerous. Diaphragms are usually wanting in the true zoëcia, but in the interstitial tubes a small number is always present. Between the diaphragms the tube cavity is always more or less inflated, giving this set of tubes a peculiar, but characteristic, beaded appearance. In tangential sections, cutting the zoarium just below the surface, the proper zoëcia are distinguished from the angular thin-walled interstitial cells, by their ovate or subcircular form, and slightly thicker walls.

Type, *T. tuberculosa*, Hall.

Of the numerous other forms referred by Prof. Hall to the genus, I have examined nearly all of the Niagara group species. Of these I find that only three are truly congeneric with the type species. These are *T. coalescens*, *T. spiculata*, and *T. solida*, the last being still somewhat in doubt, as my specimens, although from the typical locality, and agreeing quite closely with the figures and description of that species, are not strictly authentic. I find further, that the common *T. ostiolata*, Hall, belongs to a new genus of the *Fistuliporidae*, which I propose to define and found upon a Lower Carboniferous species in the next number of this publication. The internal structure of *T. osculum*, *T. infrequens*, and *T. imbricata*, from the same formation in Indiana, proves these species to belong to my genus *Coeloclema* of the *Ceramoporidae*. Superficially, they greatly resemble *T. ostiolata*.

Of the Lower Helderberg species, I have not yet been able to procure specimens, though I expect shortly to receive a lot from Prof. Hall. I have, however, before me, some proof copies, kindly given me by that eminent authority, of the beautiful plates with which their external characters will be illustrated in a forthcoming volume of the New York State Survey. Judging from these figures, I am very much inclined to doubt that any of them will be found to be correctly referred to the genus as restricted and defined by me. Some are doubtlessly referable to Meek's *Rhombopora* (e. g. *T. rhombifera*,); others (e. g. *T. constricta*) I think will be found to possess the characters of *Coeloclema*; while others again appear to be sufficiently distinct to be regarded as belonging to new genera. Of the remaining Upper Silurian, Devonian and Carboniferous species, I am not prepared to say anything more definite than that, with very few exceptions they will be found to differ generically from *T. tuberculosa*.

The relations of *Trematopora* are perhaps nearer *Atactoporella* than to any other genus of Palæozoic Bryozoa. Taking such a species as *A. newportensis*, Ulrich, we find a decided superficial resemblance to *T. tuberculosa*, Hall. However, when more critically examined, they are found to differ in the following characters: The tube-walls in *Atactoporella* are always more or less inflected, and the spiniform tubuli more numerous, the true zoæcial-tubes are provided with both cystoid and horizontal diaphragms, while in the interstitial tubes the straight diaphragms are numerous, and the tube-cavity is never constricted at the point of their occurrence. On comparing the genus with Hall's *Callopora*, we find that while in *Trematopora* the zoæcial apertures are always open, and the interstitial cell-mouths closed by a minutely perforated pellicle, the opposite is the case in *Callopora*, the proper zoæcia being commonly closed by centrally perforated opercula, and the interstitial cells always open. The most striking internal difference lies in their tabulation, diaphragms being very numerous in both kinds of tubes in *Callopora*, and exceptionally few in *Trematopora*. That the character and limits of the genus may be the more fully understood, a full diagnosis of the type species is here appended, and followed by the descriptions of two congeneric species that appear to be new.

TREMATOPORA TUBERCULOSA, Hall (Pl. XIII., figs. 2, 2a, 2b).

Trematopora tuberculosa, Hall. Pal. N. Y., vol. ii., p. 149, figs. 1a-1g, Pl. XL. A.

Zoarium irregularly ramose, branches stout, generally flattened. Surface at intervals of from .12 to .15 of an inch, measuring from center to center, elevated into rounded monticules, varying in height in different specimens. True cells with oval-apertures, surrounded by a more or less distinct peristome, which carries a variable number, rarely more than two, of rather large spiniform tubuli; longest diameter of aperture about $\frac{1}{120}$ th of an inch. Intercellular spaces of very variable width, the true cells being often in contact on one side, and separated from each other on another side, sometimes more than their diameter; cells therefore arranged in more or less interrupted series, in which, across their shorter diameter, from eight to eleven may be counted in the space of .1 inch, and from seven to nine in the same space measuring across their longer diameter. The really large and numerous interstitial cells having their apertures usually closed by a pellicular covering, rarely present stronger evidences of their presence than unequal shallow depressions between the peristomes of the true cells; they are, perhaps, most readily detected on the monticules, where the

interstitial spaces are always wider than on the concave portions of the surface.

Good and satisfactory tangential sections of this species are difficult to prepare, on account of the extreme brevity of the fully matured portion of the zoarium in most specimens. One of my sections gives a fair idea of the characters of the peripheral portion of the zoarium, and shows (Pl. XIII., fig. 2*a*) that just below the surface of matured specimens the true cells are approximately oval, and marked by rather thick, ring-like walls, within the substance of which one or two rather large spiniform tubuli are developed; they are sometimes in contact, but usually separated by large, somewhat unequal and angular interstitial cells, having much thinner walls. In a few spots the minutely perforated pellicular covering of the latter is shown. When the section passes through a slightly deeper level, the two sets of cells are scarcely distinguishable, both being now polygonal, with thin walls, frequently a little thickened at the angles of junction, and at irregular intervals more strongly so, when occupied by a spiniform tubulum. The lower and left hand sides of figure 2*a*, represents a part of the section in which the cells are just passing from this stage into the more matured phase before described.

Longitudinal sections (Pl. XIII., fig. 2*b*) show that the tubes in the axial region are comparatively large, excessively thin-walled, without diaphragms, and that they proceed in their course from their point of origin to the surface, with but a slight degree of curvature, that at no point is abrupt. When near the surface their diameter is somewhat lessened by the development of the more or less rapidly expanding interstitial tubes. The latter present a beaded appearance, being constricted at diminishing intervals, each being marked by a complete horizontal diaphragm. In the true tubes diaphragms are often wanting throughout, and in no case have I ever detected more than two in any one tube, these being placed, in all cases, one near the aperture, and the other near the origin of the interstitial tubes. The section illustrated represents a more matured state than is usual, and in the majority of sections, the outer dense portion will not be observed. This dense terminal portion of the zoarium may consist of only a single layer, or of several more or less obscurely defined layers, each of which is perforated by minute foramina, and properly belongs only to the interstitial tubes, as they represent periodic reproductions of the pellicular interstitial covering. In this, the fully matured stage of the zoarium, also the walls of the proper zoecia, when a side is laid bare, are apparently perforated by similar foramina.

Specimens of this species vary considerably in the elevation of the monticules, some being nearly smooth, while others are strongly tuberculated. Age also makes a difference in the superficial appearance of the cells, the peristomes being thinner, and the interstitial spaces deeper, in young examples.

Formation and locality: Niagara group. In the shales of the group at Lockport, N. Y. The species apparently does not occur at any western locality.

TREMATOPORA HALLI, n. sp. (Pl. XIII., figs. 3, 3a).

Zoarium ramose, slender, branches with an average diameter of about .08 of an inch, dividing dichotomously at intervals of one half inch, more or less. True zoæcia comparatively large, with broadly elliptical apertures, and a faintly elevated peristome. On account of the variable width of the interstitial spaces, they have not always the regular arrangement shown in the figure. At unequal intervals the branches present portions on which the cell-apertures are larger and more widely separated from each other than ordinary. The longer diameter of the apertures varies from $\frac{1}{120}$ th to $\frac{1}{60}$ th of an inch, while, vertically, from seven to nine may be counted in the space of .1 inch. Interstitial cells, large and numerous, but usually covered by an interstitial membrane. A few small spiniform tubuli may be observed in well preserved examples.

In tangential sections the true zoæcia are seen to be elongate, subangular, comparatively thin-walled, and more or less in contact, the intervening spaces being occupied by the unequal interstitial cells. The spiniform tubuli are small, and easily overlooked.

Longitudinal sections show that the tubes in the axial region are narrow, nearly vertical, and totally without diaphragms. As they near the surface they bend abruptly outward, and in passing into and through the narrow peripheral region, their diameter is considerably increased, and their walls very slightly thickened. The interstitial tubes, which are developed just as the true zoæcia turn outward, expand very rapidly, and have the same beaded character noticed in describing *T. tuberculosa*. The diaphragms too occur at about the same intervals. (See *T. tuberculosa*, Pl. XIII., fig. 2b.)

This species differs from the other small branching species of the Niagara group, in its comparatively large, elliptical cells.

The specific name is given in honor of the accomplished palæon-

tologist, and founder of the genus, Prof. James Hall, to whom I am indebted for many kindnesses.

Formation and locality: Niagara group, at Waldron, Shelby county, Indiana.

TREMATOPORA WHITFIELDI, n. sp. (Pl. XIII., figs. 4, 4a).

Zoarium slender, ramose, branches smooth, with an average diameter of .1 inch, and dividing dichotomously at intervals of .4 of an inch, more or less. True zoëcia subequal, with elliptical apertures, surrounded by a thin, more or less distinct peristome, and uniformly arranged in diagonally intersecting series over the entire surface; in these nine or ten occupy the space of .1 inch. The longer diameter of their apertures is about $\frac{1}{120}$ th of an inch, while the shorter or transverse diameter averages about $\frac{1}{180}$ th. The interstitial cells are numerous, usually completely isolating the true zoëcia. Their apertures vary in depth on different specimens, being in some not readily distinguishable from the true zoëcial orifices, and in others, on account of the interstitial membrane, scarcely detectable, and only indicated by shallow depressions between the peristomes of the true cells, that might be overlooked by a careless observer. Well preserved examples show a number of small spiniform tubuli, whose position is usually on the peristomes.

Tangential sections show that the true zoëcia are elliptical in cross-section, that their walls are slightly thickened by a secondary deposit on the inside, and that they are almost invariably completely isolated by a series of interstitial cells. These are angular, thin-walled, and often larger than the true cells. A few spiniform tubuli may be detected, but not readily, on account of the many particles of pyrites of iron, which always obscure, to a greater or less extent, the minute internal characters of the bryozoa from the Waldron locality.

Longitudinal sections show that the true zoëcia are entirely without diaphragms, and that they are larger and more inclined in the axial region, than is the case in *T. halli*, approaching in both respects more nearly to *T. tuberculosa*. The peripheral region is very narrow, and near the surface, always one, and often two interstitial tubes separate the true zoëcia. The interstitial tubes are usually crossed by but a single diaphragm, which is placed about midway between their point of origin, and the apertural covering. The tube is generally a little constricted where the diaphragm occurs.

This species differs from *T. tuberculosa*, Hall, in its much smaller.

smooth and cylindrical branches, which have altogether a more delicate appearance. From *T. halli*, Ulrich, it is distinguished by its larger branches and smaller cell-apertures. A comparison between the tubes in the axial region of the two species, proves that here, those of *T. whitfieldi* are the largest. The species should also be compared with *T. spiculata* and *Callopora* (?) *singularis*, Hall. From the first it differs in its elliptical cell-apertures, more distinct peristome, making it easier to distinguish them from the interstitial cells. From the latter, specimens of *T. whitfieldi* are separated by their smaller cell-apertures, and if Prof. Hall is right, by its tubular interstitial spaces, they being stated by that authority to be solid in *C. (?) singularis*.

Named in honor of Prof. R. P. Whitfield, the distinguished curator of the American Museum of Natural History of New York.

Formation and locality: Niagara group, at Waldron, Ind.

STELLIPORA, Hall, 1847.

(Pal. N. Y., Vol. I., p. 79.)

Since publishing a definition of this genus in my scheme of classification in a preceding number of this JOURNAL (Vol. V., p. 155), I have made another, more thorough, examination of the type species, *S. antheloidea*, Hall, from the Trenton limestone of New York, which, perhaps, is also the only known species of the genus. The zoarium of *S. antheloidea*, being very thin and delicate, and furthermore, very irregular in its thickness and distribution over the foreign body incrusting, I found it a matter of no small difficulty to prepare satisfactory sections. After a number of trials, I at last succeeded in obtaining a series that was in every respect more successful than the first lot. I am, therefore, now enabled to furnish the following detailed description of the species.

STELLIPORA ANTHELOIDEA, Hall (Pl. XIV., figs. 1, 1a).

(Pal. N. Y., Vol. I., p. 79, Pl. XXVI., figs. 10a-10c. Not *Constellaria antheloidea*, of Nicholson.)

Zoarium thin, growing over and often completely enveloping some foreign object (oftenest a crinoid column) to which the undulating epithecal membrane adheres, at only limited points. Scattered over the surface are conspicuous, more or less prominent stars, each of which has a diameter of .1 of an inch, sometimes more, rarely less; and is composed of a large central, usually depressed, smooth or slightly pitted, area, and of from six to twelve prominently elevated, more or less wedge shaped ridges, which radiate and slope downward from the

central space ; these occasionally are divided at the outer wide end, or more commonly, have a few shorter rays intercalated between them. The stars are of circular or elliptical shape, and occur at rather unequal intervals, being often almost in contact on one side, and separated on another side by a distance nearly equaling their diameter. The true zoëcia are entirely restricted to the elevated ridges of the stars when they are in close contact. They have subcircular apertures, the diameter of which averages about $\frac{1}{145}$ th of an inch. All the depressed portions of the star-shaped monticules, and the spaces left between them, are solely occupied by interstitial cells, the mouths of which are, so far as known, invariably covered by a faintly pitted, sometimes apparently granulose, interstitial membrane.

Tangential sections (Pl. XIV., fig. 1) show that the true cells are aggregated into irregularly wedge-shaped converging groups, that they have a subcircular form, and moderately thick walls, and that they never occur in the inter-monticular spaces, which, like the depressed rays and central area of the monticules or stars, are solely occupied by interstitial cells. These, though of very unequal dimensions, are always smaller than the true cells, from which they are further distinguished by being polygonal, and very thin walled. Often a few of these small cells are wedged in between the true zoëcia.

Longitudinal sections (Pl. XIV., fig. 1a) usually show only a very limited number of the true zoëcia, which, when the section passes through any, are distinguishable by their somewhat larger size, thicker walls, and very few horizontal diaphragms. All the tubes proceed more or less abruptly from the wavy epithelial line, to the surface, those of the smaller or interstitial set, being sometimes apparently perpendicular throughout, and without any prostrate portion whatever. I have also noticed a few instances in which but little separated tubes were inclined in opposite directions. The diaphragms in the interstitial tubes are developed at diminishing intervals, the shortest observed equaling about one third of a tube diameter.

In my scheme of classification, I placed *Constellaria*, Dana, as a sub-genus under *Stellipora*, Hall. This was, I now think, an error, and I propose hereafter to regard *Constellaria* as entitled to rank as a distinct genus. I am led to this conclusion by a critical comparison between the two species upon which the names were founded. The one, *Stellipora antheloidea*, I have just described, while of the other, I published a partial description in a preceding number of this JOURNAL.

under the new name of *Constellaria florida*. This species had long been current under the name of *Stellipora* or *Constellaria antheloidea*, from which, however, I hold it differs not only specifically but generically. My former definition of *Stellipora* and *Constellaria* above referred to, being deficient in several important particulars, I offer the following more complete descriptions.

STELLIPORA, Hall.

Zoaria incrusting, forming thin expansions over foreign bodies. Cells of two kinds, true zoecia with subcircular apertures, and somewhat smaller polygonal interstitial cells. At rather irregular intervals the surface exhibits stellate monticules, each of which consists of a more or less depressed central area, from which a variable number of equally depressed, narrow, and often bifurcated rays radiate in all directions. These rays separate the outer portion of the monticule into an equal number of elevated, irregularly wedge-shaped sloping ridges, to which the true zoecia are entirely restricted. All the depressed portions of the monticules, and the inter-monticular spaces are solely occupied by interstitial cells, the apertures of which, so far as observed, are always closed by an interstitial membrane. In sections the true cells are marked by their rounded form, larger size, thicker walls, and few horizontal diaphragms. The interstitial tubes, with only a few exceptions, are always developed from the epithecal membrane, from which they proceed, more or less directly, toward the surface. They are distinguished from the true zoecia by being polygonal, thin-walled, of unequal size, and crossed by more numerous diaphragms.

Type, *S. antheloidea*, Hall, from the Trenton limestone of New York.

CONSTELLARIA, Dana.

(Zoophytes, p. 537, 1848.)

Zoaria growing from a slightly expanded base, into erect fronds, or more or less flattened, sometimes anastomosing, branches. Cells of two kinds, true zoecia with subcircular apertures, surrounded by a slight peristome; and angular thin-walled interstitial cells. At sub-regular intervals the surface exhibits apparently solid stellate "maculæ," that may be more or less elevated above the general plane of the surface, or depressed below it. Between the slender and often bifurcating rays of the maculum, an equal number of small groups of true cells occur, which may be placed on a plane with the surrounding surface, or, as is more commonly the case, be more or less prominently

elevated into a radially divided monticule. The true cells are best developed in the inter-monticular spaces, where they are more or less isolated by interstitial cells, the mouths of which are, however, closed at the surface; in consequence, the interstitial spaces and "maculæ" appear to be solid. In sections, the axial region is seen to be occupied only by the true zoecial tubes; here they are polygonal, with very thin walls, and few or no diaphragms. As they approach the surface their walls are slightly thickened, and a large number of thin-walled interstitial tubes are abruptly developed. These sometimes have flexuous walls, and are divided by a large number of horizontal diaphragms, which, especially just beneath the surface of fully matured examples, are closely crowded, and placed upon the same level in contiguous tubes. Small spiniform tubuli are numerous, but only in fully matured zoaria.

Type, *Constellaria florida*, Ulrich, from the Cincinnati group.

A comparison between the foregoing descriptions will show the grounds upon which I propose to separate *Constellaria* from *Stellipora*. The rule, among both American and European palæontologists, has been to regard these two really distinct genera as synonymous, and, with scarcely a single exception, all drew their diagnosis of *Stellipora*, from Cincinnati examples of what I now call *Constellaria florida*, doubtlessly supposing them, as I did, to be identical with *Stellipora antheloidea*, Hall. That this supposition was erroneous, any one might have detected, by comparing the specimens with Hall's description of that genus and species. He distinctly says, that the zoarium consists of an expanded crust, "apparently attached to some other marine body." He says further, that the spaces between the elevated stars are "almost smooth, or finely granulated." Now, the zoarium of *C. florida* is never thinly expanded, and parasitically attached to foreign objects, but consists of erect flattened branches, that are as truly free as any other ramose form. The inter-monticular spaces too are never smooth or finely granulated (that is, solely occupied by closed interstitial cells), but are occupied by a large number of uniformly distributed true zoecial apertures. These important differences, if they had not shown the observer that the Cincinnati specimens were generically distinct from the New York Trenton species, he would at least have seen the necessity for a specific separation. From an examination of their internal structure, it becomes evident that they are distinguished by another difference

of just as much importance: namely, the interstitial tubes of *Stellipora antheloidea* originate, the same as the true zoœcia, from the epithecal membrane, while in *C. florida*, and other species of *Constellaria*, they are developed from the true zoœcia as these bend from the axial, and enter the peripheral region. Furthermore, while the "immature" portion of the zoœcial tubes in *Constellaria* is very long, it is exceptionally short in *Stellipora*.

CONSTELLARIA FLORIDA, Ulrich (Pl. XIV., figs. 2-2*f*).

When I described the external characters of this species in an earlier portion of this work, I excused myself from giving the complex internal characters, as I was unable then to illustrate them. I promised to complete the description when the genus, in its turn, should come up for consideration. I now fulfill that promise.

Tangential sections (Pl. XIV., figs. 2*c*, 2*d*, and 2*e*), when they cut the zoarium just below the surface, present two distinct phases, which, in sections exhibiting the two extremes, are connected by gradual intermediate stages. The appearance usually obtained in sections of this kind, is represented by fig. 2*c*. This shows that the maculæ, which at the surface appear to be subsolid, are in reality composed of numerous very thin-walled, often elongated, angular interstitial cells, varying greatly in size from the central portion of the maculum, where they are larger than the true zoœcia, to the extremities of the rays, where they usually are not more than half as large. Between these rays, from five to fifteen of the true cells are aggregated into irregularly elliptical, compact groups. The form of these cells is sub-elliptical, on account of being so compactly wedged together. In the inter-monticular spaces the true zoœcia are distinguished by their circular form, and thicker walls; they are sometimes completely isolated by a single series of rather large interstitial cells, though it is more common to see them partially in contact. When the section is cut from a sufficiently matured example, the phase represented by fig. 2*d*, may be observed. In this the walls of the true zoœcia are comparatively thick, and (the most noticeable feature) the interstitial cells in the maculæ, can scarcely be recognized. All the spaces known to be occupied by interstitial cells, now appear to be sub-solid and occupied by a mass of sclerenchyma, within the substance of which, numerous small, dark spots are noticed, generally enclosing a smaller lucid one. I am satisfied that these represent minute foramina, which perforated the successive interstitial membranes, and that they are precisely of the same

nature as the similar structures which mark the fully matured stage of *Pachydictya*, *Cystodictya*, and many of the *Fistuliporidae*. Figure 2c represents the appearance of the cells in the inter-monticular spaces, at a level nearer that represented in fig. 2d, than 2c.

Longitudinal sections (Pl. XIV., fig. 2f) show that the axial region is occupied by rather large and excessively thin-walled tubes, in which diaphragms are almost entirely absent. As they approach the surface, they bend outward abruptly, and here a large number of rapidly expanding interstitial tubes are developed, in which horizontal diaphragms recur at diminishing intervals, until at the surface they are crowded. The diaphragms as a rule are complete, and occupy the same level in contiguous tubes. Sometimes those crossing one of the large tubes (interstitial) are incomplete, and appear to form a vesicular tissue. As this, however, has not been noticed in the other species of the genus, I am inclined to regard the feature as probably due to accident, though I am not disinclined to the belief that it perhaps is also predictive. The interstitial tubes would almost appear to have been reproduced by fission, but this is evidently not the case, as in tangential sections, partially divided cells are never met with, and such would doubtlessly be of common occurrence, had the method of reproduction been fissiparous. This false appearance is due to the fact that the young interstitial tube, like those first developed, enlarges very rapidly, often attaining its full dimensions before it is crossed by the first diaphragm. In the section figured, the outer layer of interstitial cells is clear, while several just below it are filled with a deposit of sclerenchyma. This I believe is due to the filling of previous layers of cells, by the zooids of the next succeeding layer.

This species in its typical form, represented by fig. 2, on Plate XIV., is a common fossil in the Cincinnati group. It seems to range between 250 and 400 feet above low water mark in the Ohio river, at Cincinnati, Ohio. Figure 2a represents a portion of an example of this species, on which the monticules are remarkably elongated transversely. This variation from the typical form is of common occurrence, but of very little importance, since on other portions of the same specimen the monticules are like those of fig. 2, in form, size and distribution. An exactly parallel case is found in the transverse elongation of the monticules of *Callopora ramosa*, D'Orb., going to make the variety *rugosa* (*Chetetes rugosus*, Ed. & H.) Figures 3 and 4 represent two varieties, which are sufficiently marked by their external characters to render their separation from the more typical forms of the species usually an

easy task. I therefore propose the name of *prominens* for fig. 3. It is distinguished by its large and remarkably prominent monticules, which, so far as observed, never coalesce. Their diameter will average about .15 of an inch; their height about .05 inch; in the space of one half inch square, about sixteen may be counted. The branches are usually sub-cylindrical, with an average diameter of about .4 of an inch.

This variety is apparently restricted to a few feet of strata, and marks an horizon about 200 feet above low water mark.

The variety represented by fig. 4, was catalogued by me in 1880, under the name of *plana*. It has an extended geographical as well as geological range, and is, perhaps, the earliest representative of the genus *Constellaria*, occurring first in the Trenton group of Canada. Next it appears in Tennessee and Kentucky, in Safford's "Orthis Bed." This bed I regard as the upper member of the Trenton group. In the Cincinnati group it is rare near low water mark in the Ohio river. It next appears at a height of nearly 300 feet above that mark, where it again has a range of only a few feet. It is mainly distinguished from typical *C. florida*, by its nearly smooth surface. The Trenton specimens are larger than those from Cincinnati, and their branches frequently anastomose, a feature not observed in specimens from this locality.

CONSTELLARIA LIMITARIS, Ulrich (Pl. XIV., figs. 5, 5a).

(*Stellipora limitaris*, Ulrich, Jour. Cin. Soc. Nat. Hist., Vol. II., p. 126, Pl. XII., figs. 8-8c.)

My original description and figures (*loc. cit.*) of the minute structure of this species being not as good as they might be, I have refigured the sections, and written the following more complete, and, I believe, reliable diagnosis of the internal characters, as they are shown in carefully prepared thin sections.

Tangential sections (Pl. XIV., fig. 5) show that the true zoecia are bunched together between the somewhat irregular rays of the "maculæ," and that they are here separated from each other by rather thick, solid interspaces, which usually inclose a variable number of minute cells, that may be of the nature of spiniform tubuli. The "maculæ" are composed of a large number of smaller, thin-walled, polygonal interstitial cells, that only rarely attain half the size of the true cells. In the spaces between the stellar "maculæ," the true zoecia are circular, with moderately thin walls, and an average diameter of $\frac{1}{120}$ th of an inch. They are usually completely isolated by a single row of small, angular interstitial cells.

Longitudinal sections (Pl. XIV., fig. 5a) show that the tubes follow a gently curved course from the axial region of the branch to the surface. They are intersected by numerous diaphragms throughout their length; the intervals between them gradually diminish from a little more than a tube diameter in the axial region, to less than one third of a tube diameter in the peripheral region. The interstitial tubes are developed quite near the surface, and are crossed by crowded horizontal diaphragms, at, approximately, the same level in all the tubes of this set.

This species is clearly distinct, and easily distinguished from *C. florida* and its varieties. The zoarium of *C. limitaris* being usually of more robust growth, and comparatively smooth, the "maculæ" being oftener depressed than elevated. The true cells have somewhat thinner walls, are larger, and more completely isolated by the interstitial cells, which again are much smaller, and consequently more numerous than those of *C. florida*. Longitudinal sections of the two species are distinguished at a glance, by noting the difference in the tabulation of the tubes in the axial region, diaphragms being entirely absent in that portion of the tubes of *C. florida*, and very remote even in the peripheral region, while they are numerous throughout in the true tubes of *C. limitaris*.

Formation and locality: Cincinnati group. Fragments of this species are not uncommon in the upper portion of the series, at an elevation corresponding to a height of from 600 to 700 feet above low water mark at Cincinnati, O. These strata are at least 200 feet higher than any certainly known to contain *C. florida*. My best specimens I collected near Blanchester, Ohio.

CONSTELLARIA FISCHERI, n. sp. (P. XIV., figs. 6-6c.)

Zoarium somewhat irregularly frondescent or palmate, varying in thickness from .16 to .25 of an inch, with a height of about two inches. Scattered over the entire surface are small, more or less regularly arranged, stellate "maculæ," that sometimes are elevated into small conical monticules, but more commonly remain on a level with the general plane of the surface. In the transverse series the specimens examined show a variation in the number that may be counted in the space of .5 of an inch, of from eight to thirteen, while in the longitudinal series from six to ten occur in the same space. On the specimen figured the maculæ are more widely separated than they are on any other seen. Cells sub-equal, from thirteen to fourteen in the space of

.1 inch, with more or less rounded apertures, that are separated from each other by rather thin interspaces. These, and the stellate maculæ, appear to be solid at the surface, but sections prove them to be occupied by a large number of small interstitial cells.

Tangential sections (Pl. XIV., fig. 6*b*) clearly demonstrate the distinctness of the species. They show that the maculæ are composed of aggregations of very small, sub-equal, interstitial cells, the walls of which are comparatively thin, but never excessively so. The true zoecia are circular, have a diameter of about $\frac{1}{165}$ th of an inch (including their walls), and are in all cases more or less completely isolated by a row of small interstitial cells. The walls of all the cells vary slightly in thickness, according to the depth shown in the section. Just below the surface of fully matured examples, the interstitial cells are at least partially filled, and often much obscured by a secondary deposit. A rather large number of spiniform tubuli may be observed, which, however, on account of their very small size, are but an inconspicuous feature in these sections.

In longitudinal sections (Pl. XIV., fig. 6*c*) the tubes in the axial region of the zoarium are nearly vertical, thin-walled, and without diaphragms. As they near the surface they turn abruptly outward, and proceed directly to the same. In the peripheral region they are more or less separated from each other by the small interstitial tubes, according as the section passes through one of the maculæ, or the spaces between them. The intervals between the diaphragms which are developed in this portion of the true zoecial tubes, diminishes outwardly from about two tube diameters, to one half a tube diameter. The interstitial tubes are traversed by horizontal diaphragms, that are placed upon the same level in all, and excessively crowded just beneath the surface. An interesting fact, that may also be true of other species of the genus, is brought out in one of my sections: namely, all the small cells going to make up one of the "maculæ," are the progeny of a single, frequently multiplied, parent cell.

Although this species is a true *Constellaria*, it differs from the other species and varieties of the genus, in several, more or less important, particulars. First, in never having groups of the true zoecia wedged together and raised between the rays of the maculæ, but there, as in the intervals between the stellate maculæ, they are separated, more or less completely, by a series of interstitial tubes. Second, the true zoecia are apparently never raised above the surface, but it is the maculæ that are occasionally elevated. Third, the interstitial cells

occupying the maculæ, and intertubular spaces are decidedly smaller. Fourth, the true zoœcia have a diameter of $\frac{1}{165}$ th of an inch, while those of *C. florida*, and *C. limitaris*, measure respectively $\frac{1}{145}$ th and $\frac{1}{120}$ th of an inch. Fifth, the number of stars on the surface of both *C. florida*, and *C. limitaris*, in the space of one half inch square, never exceeds thirty-six, being, furthermore, usually about twenty-five, and in the var. *prominens*, as few as sixteen. On the other hand, those of *C. fischeri*, I have observed to reach the number of one hundred and thirty in the same space. This large number is sometimes reduced to fifty or sixty, but usually to about eighty. Lastly, *C. fischeri* agrees with *C. florida*, and differs from *C. limitaris*, in the absence of diaphragms in the axial region of the zoarium, while it differs from the former, and agrees with the latter, in having these structures more numerous in the peripheral portion of the true zoœcia.

The specific name is given in honor of Prof. Moritz Fischer, to whose generosity I am indebted for the opportunity of describing this interesting form.

Formation and locality: Cincinnati group. The specimens upon which the species is founded, were collected near Mt. Sterling, Ky. Judging from the associated fossils, I regard the strata as equivalent to those exposed at Cincinnati, O., at an elevation of from 300 to 400 feet above low water mark in the Ohio river.

The family relations of the following three genera are uncertain. Each presents one or more characters in which it differs more or less decidedly from all of the established families of the bryozoa, while at the same time they differ quite as strongly from each other. Believing it unwise to propose at this time new families for their reception, which, it is not improbable the discovery of congeneric forms might prove to have been unnecessary, I think it will be best, under the circumstances, to refer them, provisionally, to the families to which they appear to offer the greatest affinity. Thus, *Idiotrypa* may be placed with the *Monticuliporidae*, *Anisotrypa* with the *Rhabdomesontidae* (Vine), and *Heliotrypa* with the *Stictoporidae*.

IDIOTRYPA, n. gen.

Zoaria parasitically adhering to foreign objects. Cells of two kinds, the true zoœcia being sub-circular, with a slightly elevated, thin peristomè, and more or less completely separated from each other by a series of large, angular interstitial cells. The two sets of cells are not distinguishable

in vertical sections, both being crossed by thick horizontal diaphragms, occurring at short and regular intervals, so as to divide the zoarium into so many equal layers. The spiniform tubuli are numerous, of moderate size, and comparatively thin walled. Beside these a tangential section will show numerous, concentrically arranged, small dark or light spots, within the substance of the horizontal partitions.

I have been obliged to establish this genus for the reception of a most peculiar bryozoan from the Niagara group of Indiana. In its general form and superficial aspect, it does not present any striking differences from species of *Atactoporella*, except in the circular, and not petaloid zoöcial apertures. Thin sections, however, demonstrate, beyond a doubt, that the structural peculiarities of the two are widely different, and that, so far as our present knowledge extends, we have in *Idiotrypa* an uniquely differentiated structural type.

IDIOTRYPA PARASITICA, n. sp. (Pl. XIII., figs. 1-1c.)

Zoarium consisting of parasitic expansions, of variable thicknesses, usually attached to ramose bryozoa, but sometimes growing upon other foreign bodies. The true zoöcia have circular apertures, often closed by centrally perforated opercula, of an average diameter of $\frac{1}{120}$ th of an inch, surrounded by a slightly elevated, thin, granulose, peristome. They are arranged with considerable regularity in series, in which from eight to ten may be counted in the space of .1 of an inch. The inter-tubular spaces are of somewhat variable thickness, and usually appear to be solid; occasionally, however, the mouths of shallow interstitial depressions may be observed. The spiniform tubuli usually do not constitute a conspicuous external feature.

Tangential sections (Pl. XIII., figs. 1 and 1c) show that the walls of the true cells are marked by a dark circular band, equivalent to the peristome surrounding the apertures. Within this band may be noticed, beside a limited number of rather thin-walled spiniform tubuli, a large number of smaller circular structures, usually provided like the spiniform tubuli, with a very minute lucid central spot. These doubtlessly represent the granules above stated to occur on the peristome, in well preserved examples. The visceral cavities of all the cells appear to be more or less filled by sclerenchyma. This is due to the fact (shown in vertical sections) that the horizontal partitions are thicker at their junction with the walls of the tubes than they are more centrally, the cavities left between them being, therefore, of lenticular form. Some of the true

zoecia show a central, obscurely circumscribed area, that may represent the openings of opercula of previous layers. These sections show further, that whenever the horizontal partitions are brought to light, a large number of concentrically arranged, dark or lucid spots may be detected, which in the true cells gradually increase in size toward the circumference.

Vertical sections (Pl. XIII., fig. 1*b*) show that the tubes arise rather abruptly from the attached basal membrane, near which their walls are comparatively thin. The upward direction of the tubes is often so irregular that a section can not be made to pass through their full length. The most regular portion seen in any of my sections is represented by the figure above referred to. From this section we learn, first, that both the vertical and horizontal partitions are of variable thickness (the extremes are shown in the figure); secondly, that the latter are developed at approximately the same level, and at nearly equal and short intervals, in all the tubes; thirdly, that there are no certain marks by means of which one set of cells may be distinguished from the other; and lastly, that a row of dark spots may often be detected in the lower half of the thick horizontal partitions.

I have not now the time, nor am I perhaps fully prepared, to discuss the affinities of this remarkable form. It presents characters that are at total variance with the *Monticuliporidae*, and nearly all other bryozoa known to me. My opinion of *Idiotrypa* is, that its zoarium consists of more or less numerous layers of cells, which, just as is the case in some of the *Celleporidae* (e. g. *Cumulipora*, Mstr. emend. Reuss.), being developed one from the other, in direct sequence, eventually assume a tubular character. Further, I believe, that the horizontal partitions represent the opercula of previous layers which were left behind at successive stages in the growth of the zoarium. These opercular coverings were, I am convinced by the evidences at hand, perforated by minute foramina, which in their subsequent use as the floor of the succeeding layer of cells, have been filled up, and the whole generally thickened by a secondary deposit of sclerenchyma. In the course of this memoir, I have several times stated that a similar method of reproduction, at least in the "matured" or peripheral region of the zoarium, is indicated in several members of the *Monticuliporidae* (e. g. *Callopora*, Hall, and *Stenopora*, Lonsdale). Between *Idiotrypa parasitica*, and those forms, there is, however, this fundamental difference, that in the new genus the zoarium is not divided

into clearly differentiated "mature" and "immature" regions, such as I have shown to mark, without exception, all of the *Monticuliporidae*, if, indeed, not all of the TREPOSTOMATA. In this respect, *Idiotrypa* more nearly resembles the *Celleporidae*, and its affinities with that family of the CHEILOSTOMATA, is strengthened by the apparently poriferous condition of its horizontal and vertical partitions. On the other hand, however, *Idiotrypa* is fundamentally distinguished from *Cumulipora*, and other members of that family, in having, as is clearly proven by tangential sections, two distinct sets of cells. From all of the *Monticuliporidae*, in which two sets of cells are present, this genus is further distinguished (that is, if we regard the horizontal partitions dividing the zoarium of *Idiotrypa*, as equivalent to the diaphragms of the majority of the TREPOSTOMATA), by the equal tabulation of the interstitial and true cells, the diaphragms in the interstitial tubes of all the dimorphic *Monticuliporidae* known to me, being more numerous than they are in the proper zoecia.

Taking these various and important differences into account, I come to the conclusion that *Idiotrypa* should not be placed into the family *Monticuliporidae*, but not knowing where else it might be more properly placed, and being unwilling to found a new family for the reception of a single species, I am forced, provisionally, to refer the genus to that family.

Formation and locality : Niagara group. I obtained my specimens from the lower calcareous portion of the formation, at Osgood, Ind., where the species is associated with species of *Holocystites*, *Caryocrinus ornatus*, Say, *Saccoerinus speciosus*, Hall, and *Callopora elegantula*, Hall.

ANISOTRYPA, n. gen.

Judging from the only species known, the generic characters are as follows :

Zoaria ramose, branches hollow, consisting of one or more distinct thin layers of cells, the inner side of each being lined by a slightly wrinkled epithecal membrane. Zoecia tubular, short, arising rather abruptly from the basal membrane. Walls in the "immature" region excessively thin, but abruptly thickened as they bend outward, and proceed directly to the surface. At a point marking the termination of the thin portion of the cell-walls, a diaphragm crosses the tubes at a right angle. True zoecial apertures placed at the bottom of an expanded vestibule. Interstitial cells, and spiniform tubuli, wanting.

At intervals the surface exhibits the apertures of one or two cells, which are much larger than the average, and may represent oœcia.

The typical and only known species of this genus is simple enough in its structure, yet despite its simplicity, I have not been able to determine its affinities in a manner satisfactory to myself. The genus is clearly a member of the TREPOSTOMATA, but of what family of the sub-order is not so readily determined. It possesses one point of structure common to all of the *Ptilodictyonidæ* and *Stictoporidae*; but in all other respects the genus differs so widely from those families that I can not for a moment admit that *Anisotrypa* is referable to either. The point of resemblance is found in the diaphragm crossing the tube-cavity at the base of the erect and thickened portion of the zoœcia, which, I believe, constitutes the floor of the "matured" cell. The same character is also present in the *Rhabdomesontidæ*, though not so strongly developed. This family, lately established by Mr. Vine, for the reception of the genus *Rhabdomeson*, Y. and Y., is, I think, warranted by the peculiarities of cell-structure, and not upon the "central rod," that character being, in my opinion, of only generic value at the most. I have examined the *R. gracile*, Phill., the type of the genus, and find that, aside from the axial tube, the genus differs in no other respect from Meek's *Rhombopora*. As I intend to discuss the relations of this family at some length, in the next number of this JOURNAL, I will not further anticipate my conclusions, than to say that *Anisotrypa* appears to be more nearly related to *Rhabdomeson* and *Rhombopora*, than to any other forms known to me.

ANISOTRYPA SYMMETRICA, n. sp. (Pl. XIII., figs. 5-5c).

Zoarium ramose, branches hollow, consisting of one or two distinct layers of cells, the inner sides of which are lined by a thin, slightly wrinkled epitheca; diameter of branches varying from .15 to .3 of an inch; thickness of each layer of cells, .03 of an inch, or a little less. Zoœcia hexagonal or pentagonal, with a very regular arrangement in groups, the centers of which occur at intervals of about .12 of an inch. From the center of each group, usually marked by an extremely large cell, to a point midway between the groups, they gradually diminish in diameter from $\frac{1}{5}$ th to $\frac{1}{6}$ th of an inch. The diameter of the large central cell, which is probably an oœcium, may exceed $\frac{1}{6}$ th of an inch, though it is usually a little less. The boundary of the zoœcia is marked by a slightly elevated line, from which the walls slope down-

ward, and form what is called a vestibule, at the bottom of which is the true zoöcial aperture. This varies somewhat in size, and is often covered by a centrally perforated operculum. Interstitial cells and spiniform tubuli wanting.

Tangential sections (Pl. XIII., fig. 5b) show that the zoöcia have thick walls, and that the line of demarcation between them is sharp and distinct. The structure of the large (?) oöcial cells does not differ in any appreciable manner from that of the ordinary cells.

Longitudinal sections (Pl. XIII., fig. 5c) show that at first the tubes are inclined, and separated by very thin walls. At the termination of this, the "immature" region, they assume an erect position, their walls are suddenly much thickened, and a diaphragm is thrown across the tube cavity. The walls now have a thickness equaling, or exceeding the diameter of the true zoöcial aperture, and are composed of a number of \wedge shaped layers of sclerenchyma, each of which doubtlessly marks a previous vestibule. The true apertures are often closed by opercula, which are usually preserved in place, in the tubes of the inner layer, when the zoarium consists of two layers.

Formation and locality: Kaskaskia group. The species occurs at several localities in Kentucky, and, I believe, also in Illinois. The types are from Grayson Springs, and Tateville, Ky.; at the first place, specimens were not uncommon.

HELIOTRYPA, n. gen.

Zoarium bifoliate. Cells of two kinds; true zoöcia, with vestibules and subcircular orifices, and numerous small interstitial cells. The prostrate, thin-walled, inner portion of the tubes, is divided from the outer, much thickened and erect portion, by an incomplete diaphragm, which springs from the convex wall at the termination of the prostrate or "immature" portion of the tube. In the peripheral or "mature" region of the zoarium, the true zoöcia are subcircular in form, more or less in contact, and provided with thick walls, which are perforated by numerous minute canals, that, on account of their oblique direction, give tangential sections a peculiar rayed appearance. The line of separation between all the cells is marked by a row of vertical tubuli, with which the oblique series seem to communicate. These again appear to be in connection with other canals, that traverse the intervals between the basal membranes of the two leaves, and the comparatively thin walls of the tubes in the "immature" region of the zoarium. The interstitial tubes are developed from the prostrate

portion of the zoœcia, and are crossed by a few diaphragms. Apertures of true zoœcia closed by opercula.

This genus differs from all other bryozoa known to me, by its complicated system of inter-communication.

HELIOTRYPA BIFOLIA, n. sp. (Pl. XIII., figs. 6-6c.)

Zoarium consisting of two thin leaves, grown together back to back, by the adhesion of their basal membranes. Each has a thickness of about $\frac{1}{90}$ th of an inch, and the largest expansion noticed, has a superficial area of about three square inches. True zoœcia very regularly arranged in quincunx, or in longitudinal and transverse series, with moderate vestibules, and circular apertures. At intervals of .1 inch, measuring from center to center, the surface exhibits small "maculæ," around which the true zoœcia are a little larger than in the intervening spaces. Ten or eleven of the ordinary size occupy the space of .1 inch. The actual orifices are separated from each other by interspaces twice as wide as their diameter, and, on protected spots, preserve the centrally perforated opercular covering. The interstitial tubes are represented by numerous small pits in the "maculæ" and interspaces between the vestibules of the true zoœcia. They are often more numerous than is shown in figure 6. Besides these, the mouths of a vast number of minute pores may be observed in the substance of the walls.

Tangential sections (Pl. XIII., fig. 6a) show that the true zoœcia are more or less in contact, the line of contact being marked by a closely arranged series of vertical tubuli, which also define, but less distinctly, the outlines of the thick-walled interstitial cells. The true zoœcia have an average diameter of about $\frac{1}{110}$ th of an inch, while that of the visceral cavity is about $\frac{1}{350}$ th inch. If the section is not too thin, and cuts the zoarium just below the surface, a large number of minute tubuli are shown to pass through the walls of the cells, in a radial manner around their visceral cavities.

Longitudinal sections (Pl. XIII., figs. 6b and 6c) show that the zoarium consists of two separate leaves, the basal membranes of which adhere to each other. Between these, as well as between the double cell-walls in the "immature" or inner region of the zoarium, there may be detected a large number of minute tubuli, which, I believe, represent connecting foramina, or "endosarcial passages," as Mr. Vine calls a similar feature in the *Stictoporidae* and *Ptilodictyonidae*. The tubes at first are thin-walled, and prostrate. Just as they are about to assume an erect position, they are more or less constricted, or cut in two, by an

incomplete diaphragm. The thickened outer region increased by successive layers, which slope down into the apertures, and are traversed by numerous minute canals, opening into the vestibules and visceral cavities of the cells. These appear to communicate with a vertical series of tubuli, which are placed between, and mark the line of division between adjoining tubes. The interstitial tubes are abruptly developed from the upper wall of the prostrate portion of the zoëcia, and are crossed by two, rarely three horizontal diaphragms.

Formation and locality: Kaskaskia group. I found the types at Tateville, Ky., on the line of the Cincinnati Southern R.R.

[TO BE CONTINUED.]

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On February 12th, the 74th Anniversary of Darwin's birth, the following subscribers presented to the Society a set of the great naturalist's books:

J. H. Hunt, M.D., Davis L. James, Edw. M. Cooper, Capt. L. Barney, A. E. Heighway, M.D., Prof. A. P. Morgan, Henry Hanna, Chas. Dury, U. P. James, Robt. Clarke, Jos. F. James, F. W. Langdon, M.D., Miss Sarah C. Stubbs, Prof. Geo. W. Harper, Paul Mohr, W. W. Thompson.

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Page 216, line 23, for *auditing*, read *audience*.

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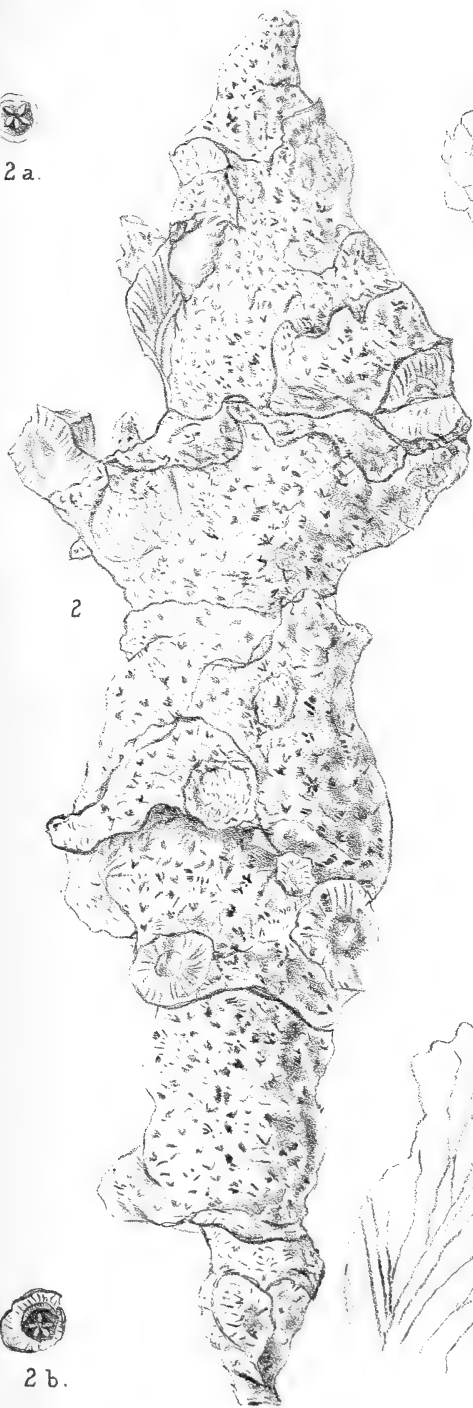
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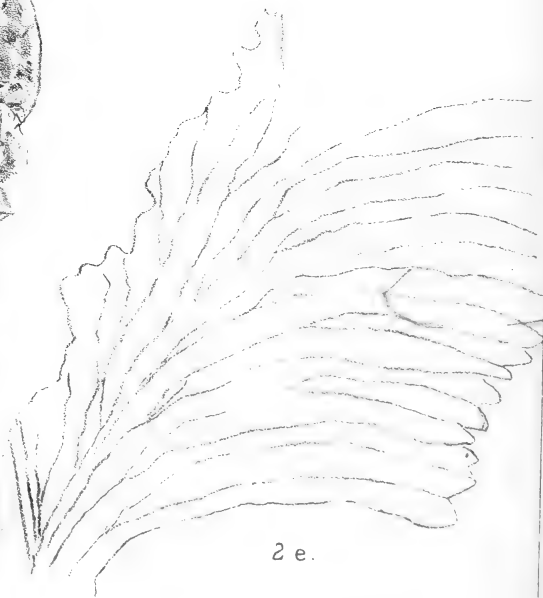
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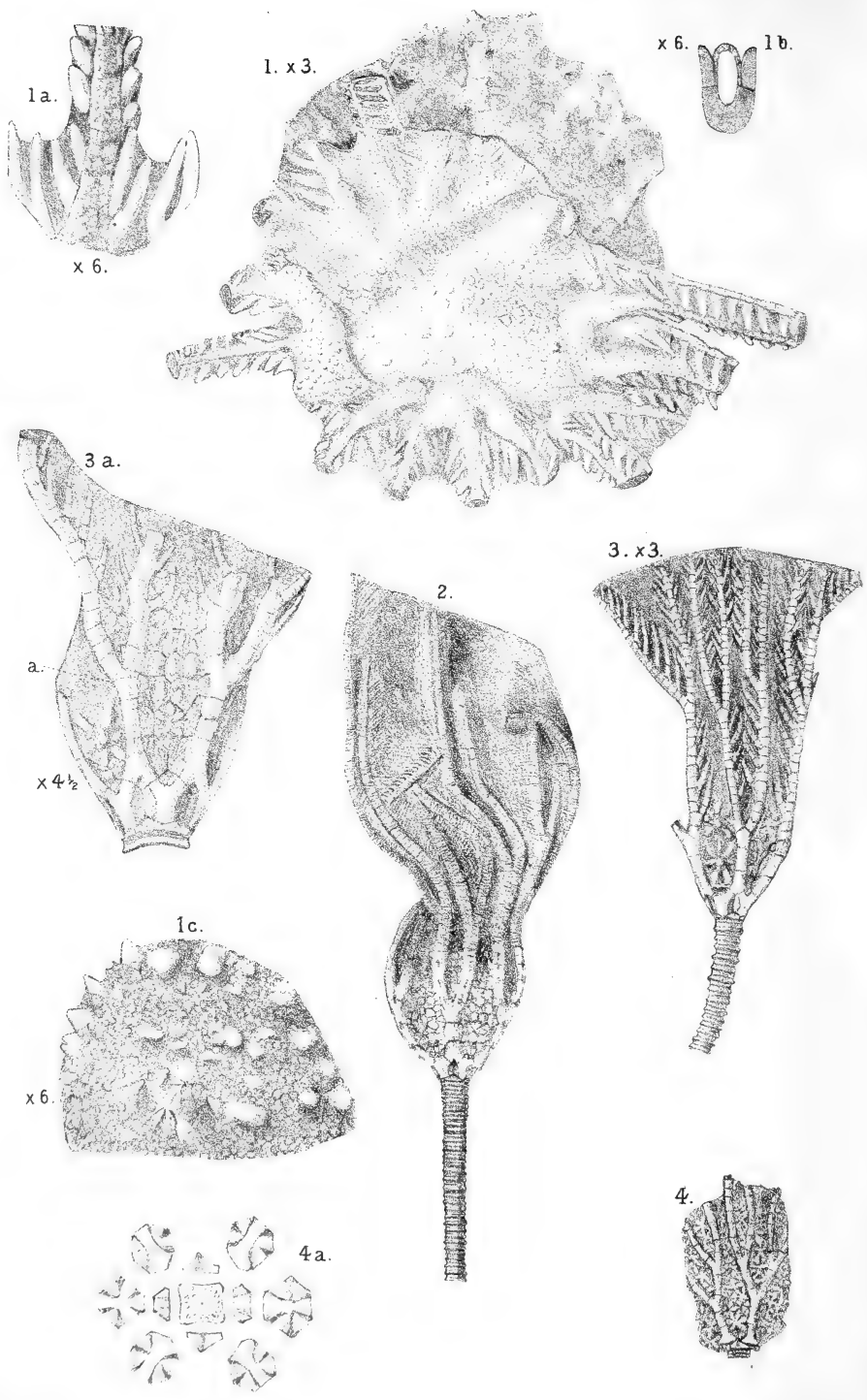
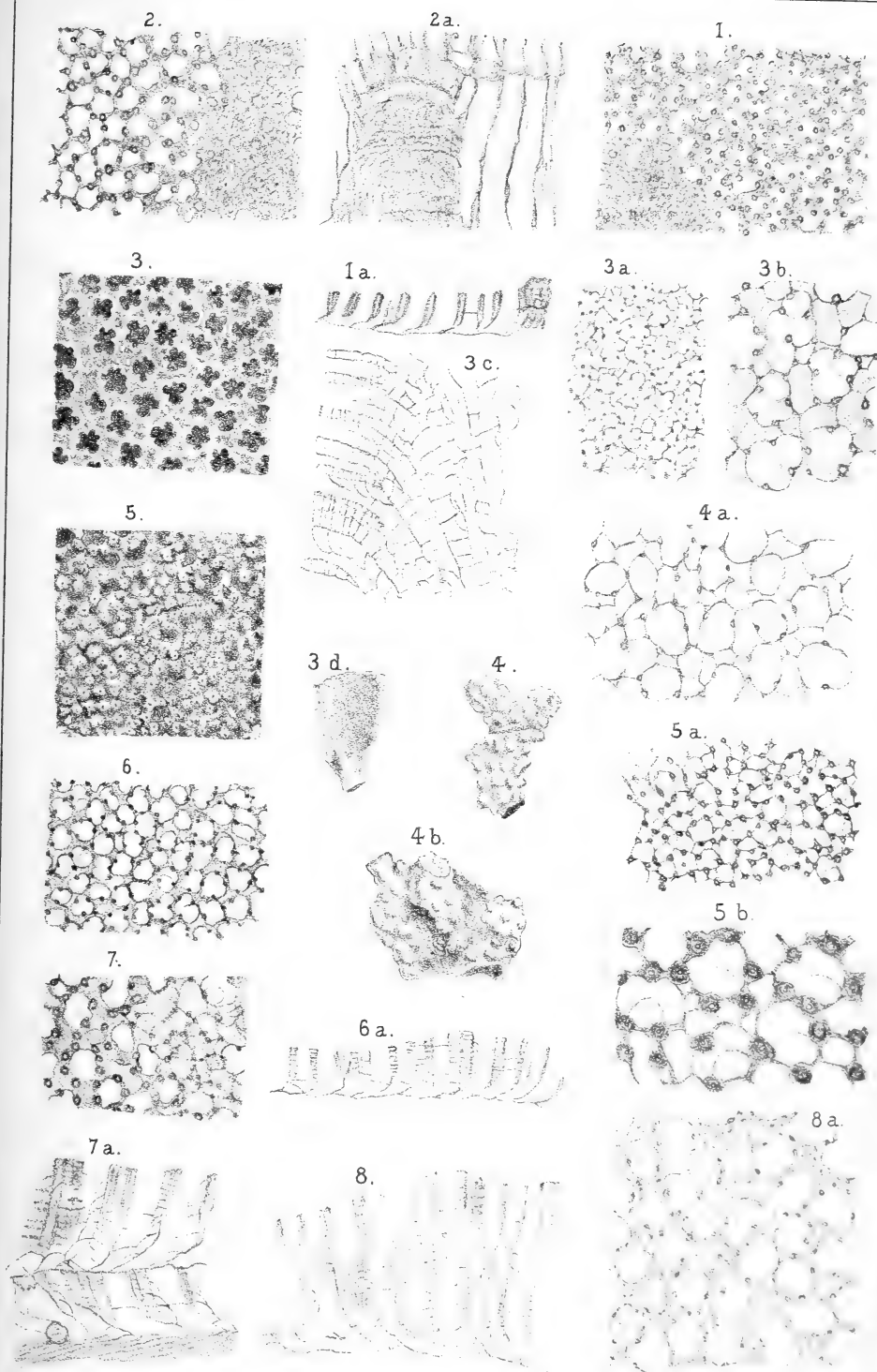


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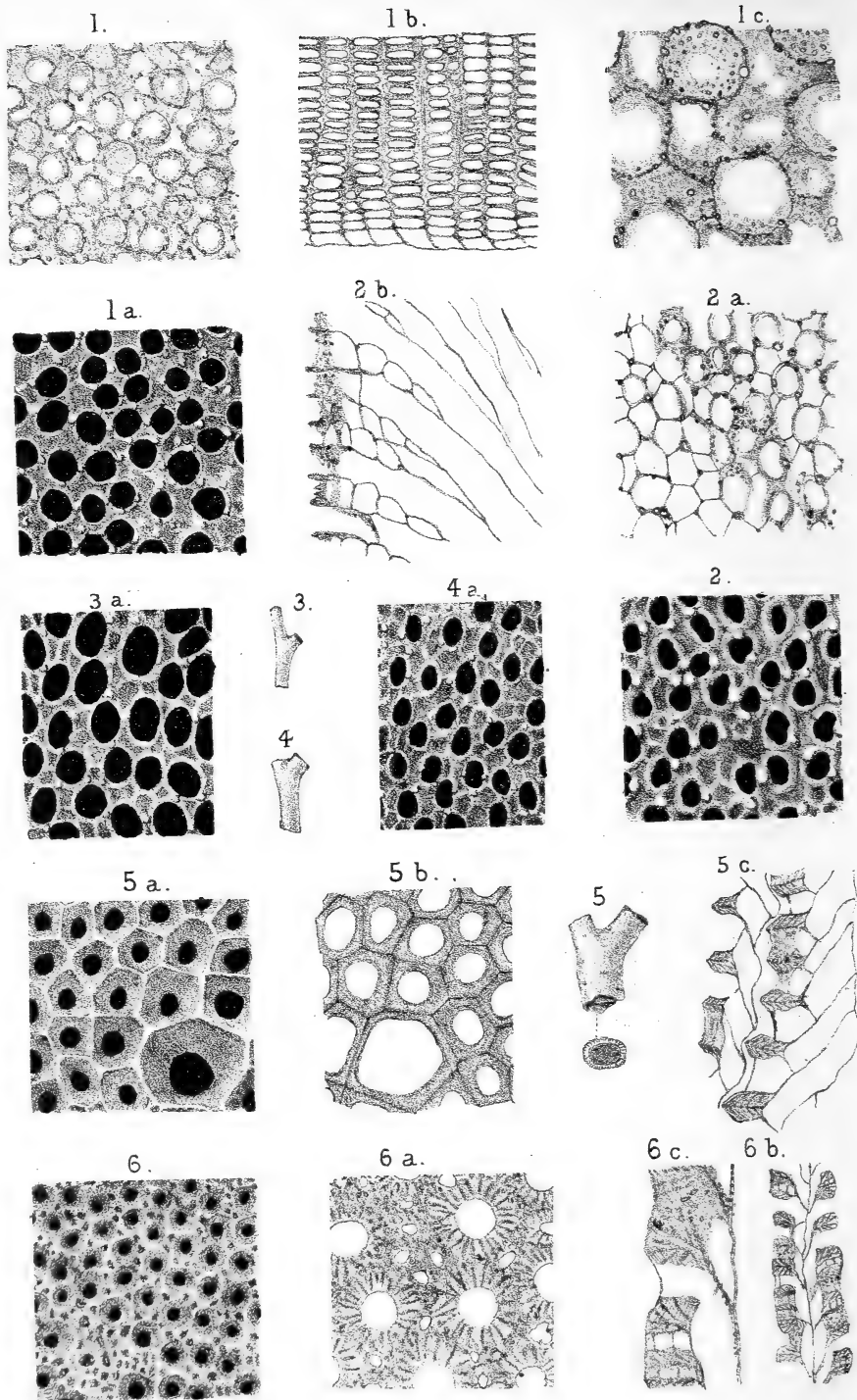
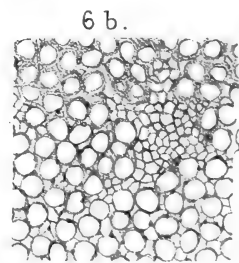
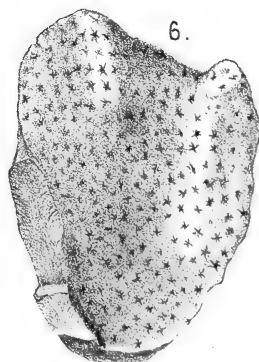
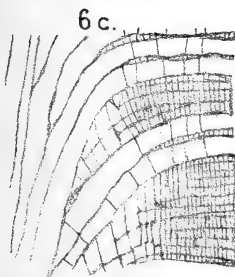
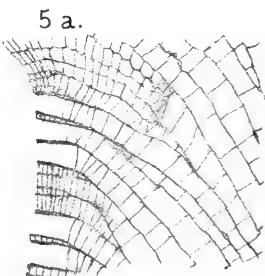
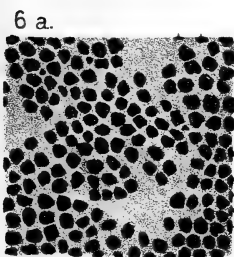
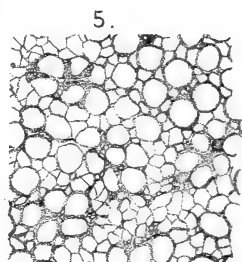
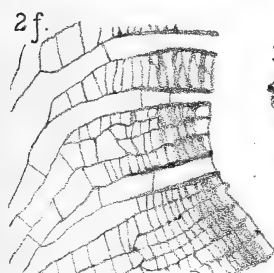
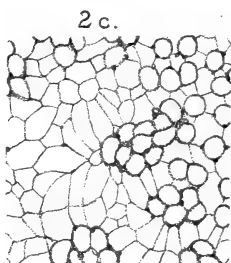
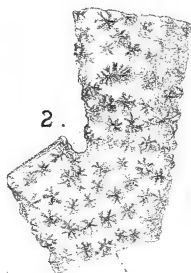
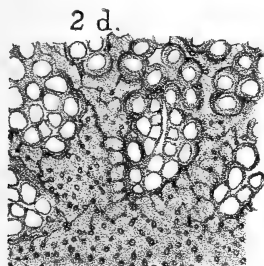
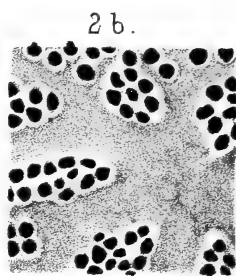
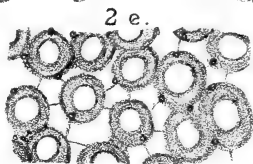
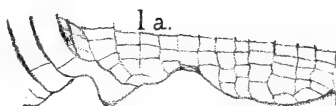
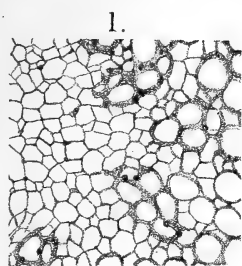


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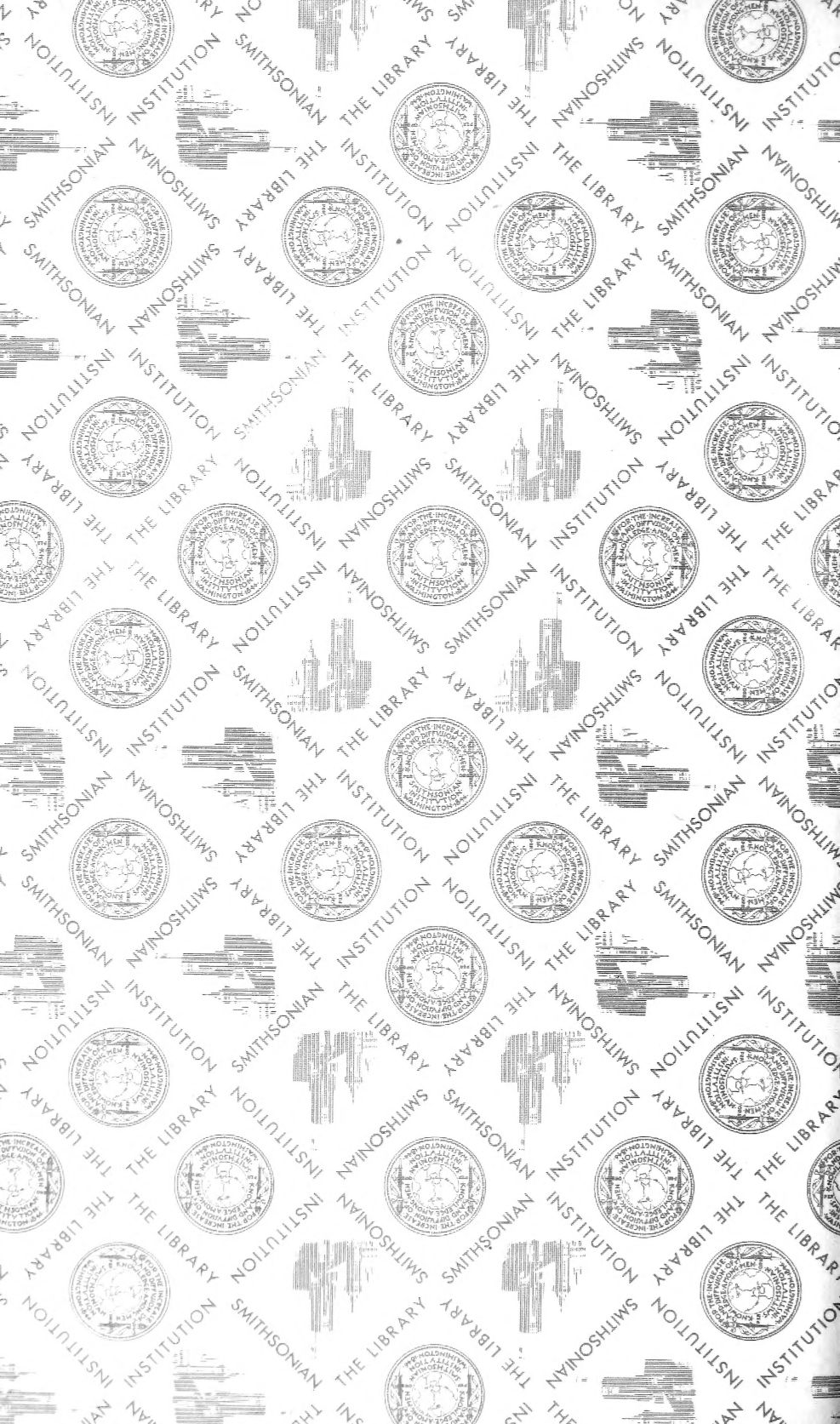
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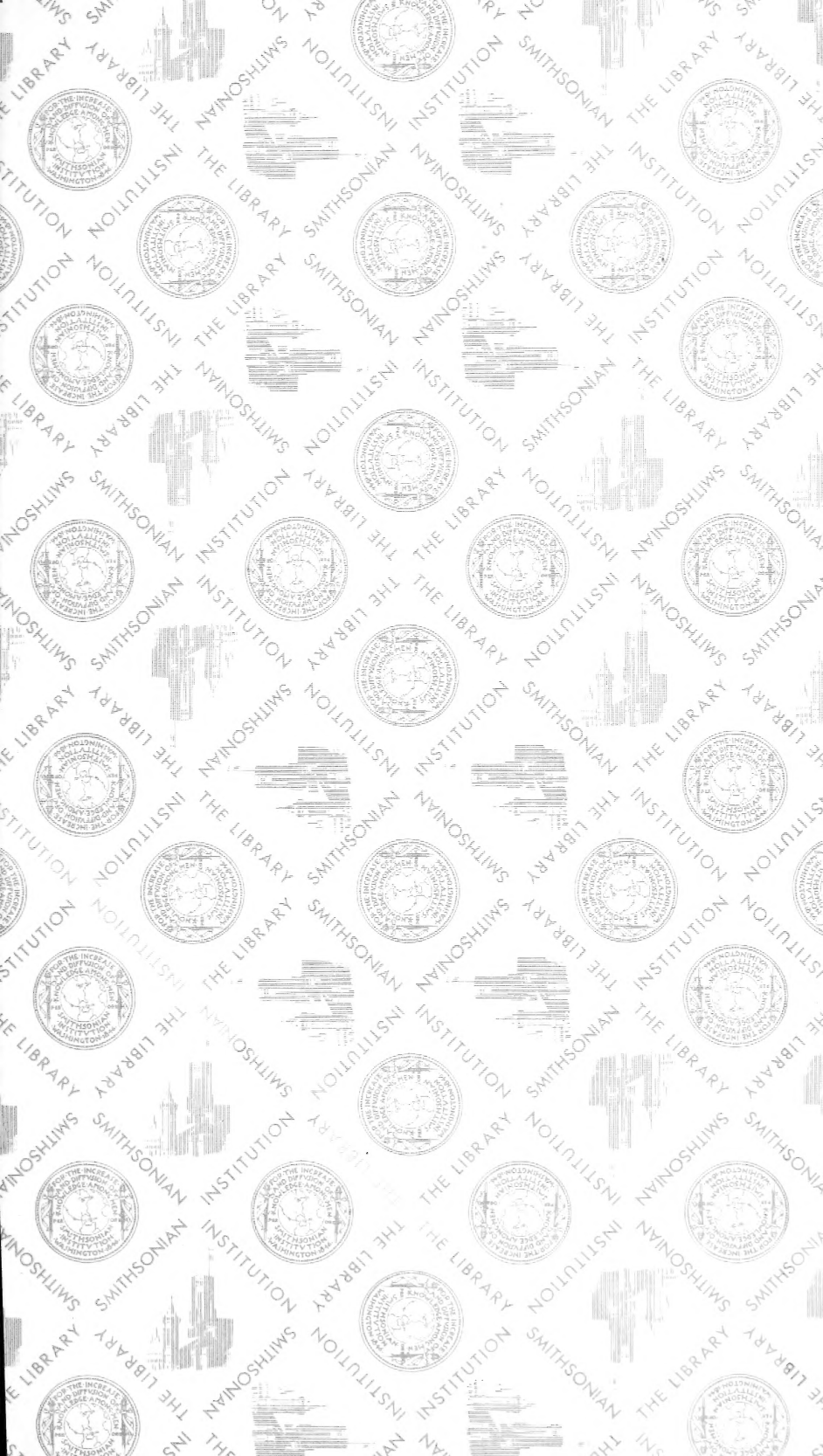
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